RUBBER WORLD

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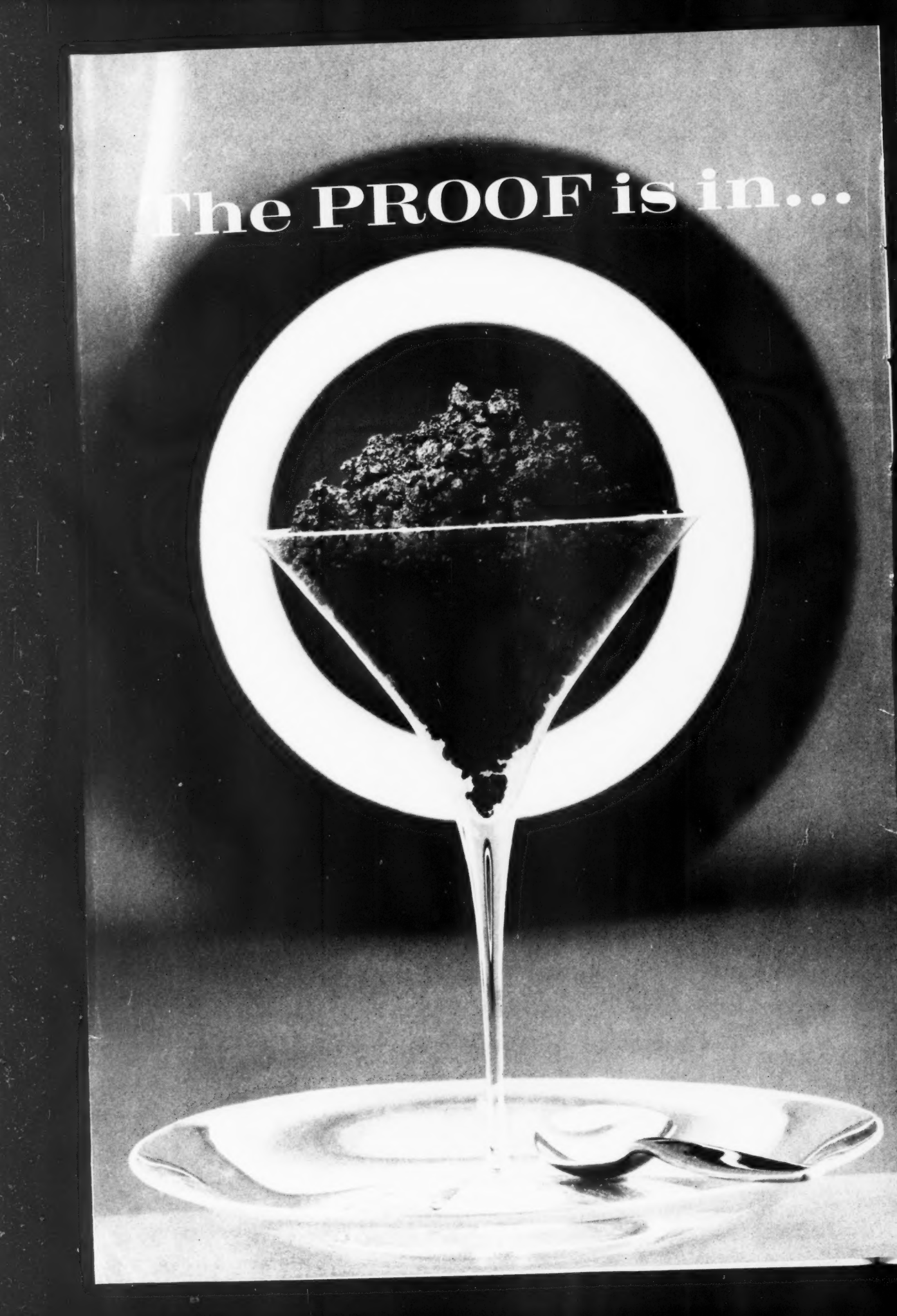
TECHNOLOGY DEPARTMENT

SEPTEMBER, 1960

NEOPRENE RUBBER EXPANSION JOINT HELPS MEET NEEDS OF HIGH-SPEED JET-AGE ROADS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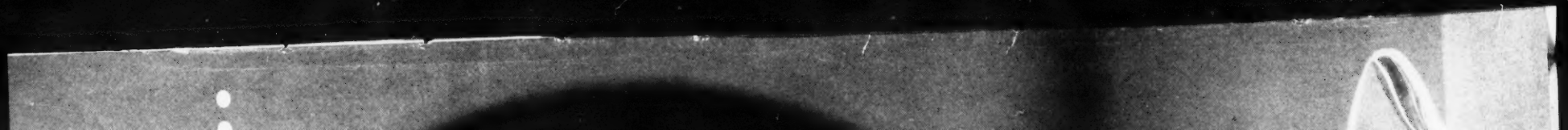
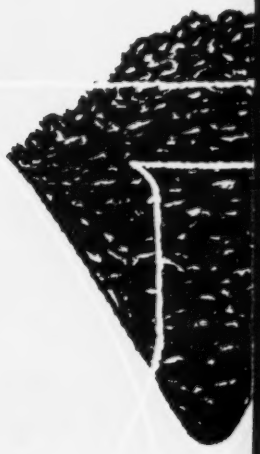


the black maste

from Baytown

A dispersan

Made by a manufacturing te

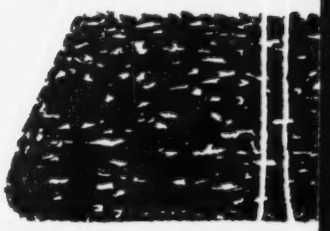


The new United-Barclay technique* makes possible this improved product potential. Baytown's traditionally superior product uniformity, processibility and ease of handling have been increased.

In addition –

These new dispersant-free SBR black masterbatches, tested on independent tracks, have shown wear ratings that are second to none.

Each of these new tread, carcass and mechanical goods black masterbatches offer improved extrusion and excellent physicals.



The final proof of this new product potential ultimately lies in your hands. Larger than "pudding-size" (i.e. truckloads for instance) samples are ready for your testing. Please contact your United Carbon representative or write to – United Carbon Company, Inc., 410 Park Ave., New York 22, N. Y.

*Patents Pending

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BAYTOWN'S 8675 FOR TREAD STOCK
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- 9 parts naphthenic oil
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- 100 parts SBR copolymer
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- rosin/staining

BAYTOWN'S 8775 FOR TREAD STOCK
- 100 parts SBR copolymer
- 75 parts HAF black
- 37.5 parts aromatic oil
- mixed/staining

BAYTOWN'S 8750 FOR CARCASS, SIDEWALL AND MECHANICAL GOODS
- 100 parts SBR copolymer
- 50 parts SRF black
- 17.5 parts high aromatic oil
- rosin/staining

BAYTOWN'S 8776 FOR EXTRUSIONS AND MECHANICAL RUBBER GOODS
- 100 parts SBR copolymer
- 50 parts HAF black
- 37.5 parts naphthenic oil
- mixed/non-staining

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RUBBER WORLD

VOLUME 142 NUMBER 6 SEPTEMBER, 1960

CONTENTS

69 New Synthetic Rubber Institute Should Further Worldwide Progress
An editorial by R. G. Seaman

It is hoped that great strides will be made in areas lending themselves to cooperative effort by this synthetic rubber producers' association now in the process of formation.

71 Determinants in Research
W. B. Wiegand

Goodyear Medalist gives his six determinants which, plus action, lead to successful achievements by those engaged in research projects.

78 Coatings for Molded Rubber Products
R. L. Hawkins, Jr.

New coating technology permits the use of these surface films on the rubber part for looks or serviceability without cracking or peeling.

81 Environmental Resistance of Estane Urethane Materials
Schollenberger, Pappas, Park, Vickroy

Urethane proves to be quite good in radiation resistance.

89 RMA Mechanical Goods Subdivision Meeting

Discussions on marketing and economic outlook held.

92 ASTM Committee D-24, Carbon Black, Meeting

Results of year's work on specifications show continued progress.

Cover photo: Courtesy of E. I. du Pont de Nemours & Co., Inc. (see page 101)

SERVING THE RUBBER INDUSTRY SINCE 1889

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FEATURE DEPARTMENTS

News of the Rubber World	9
News from Abroad	10
New Equipment	20
New Products	30
Book Reviews	40
New Publications	44
Meetings and Reports	89
Washington Report	94
Calendar of Coming Events	100
Industry News	101
News Briefs	105
News About People	108
Obituaries	114
Market Reviews	124
Synthetic Rubber Prices	130
Compounding Ingredients Prices	133
Index to Advertisers	147

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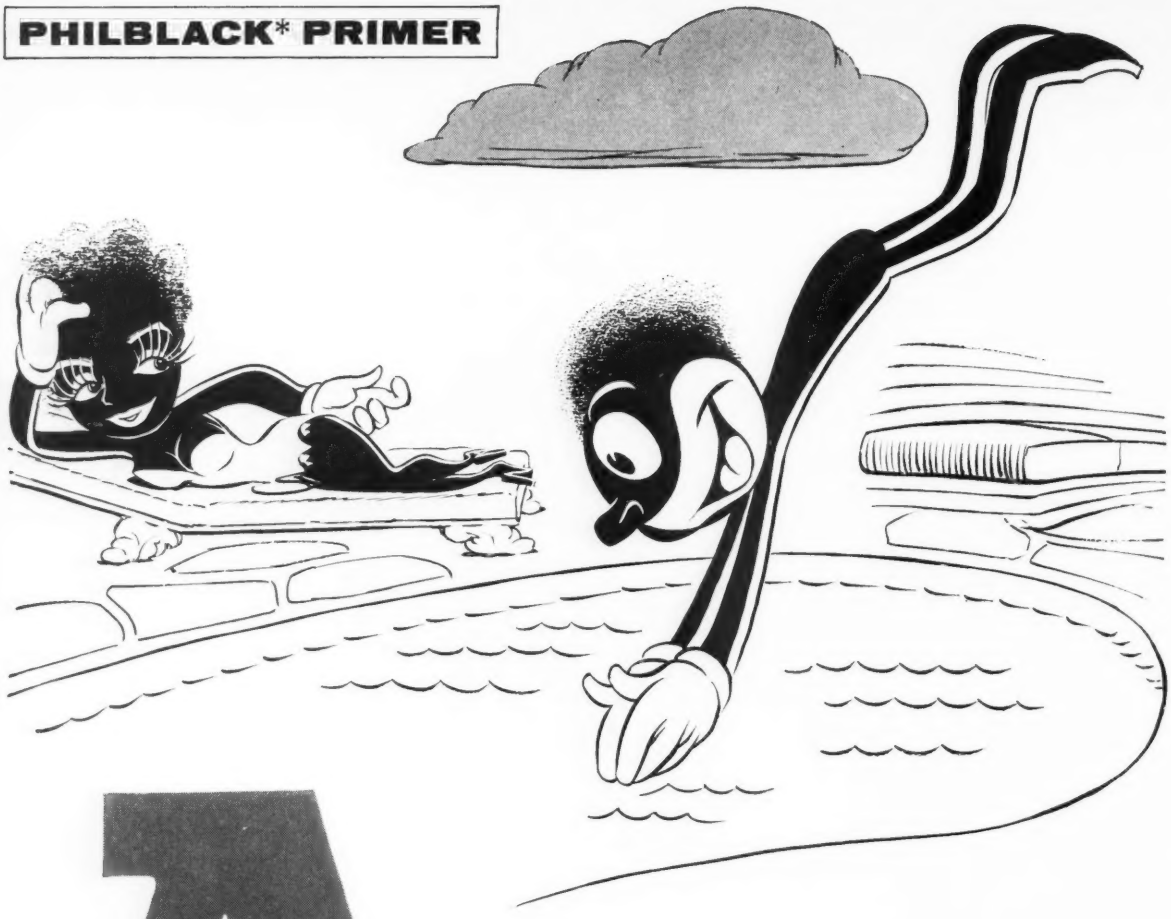

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Cool off with Philblack A! With this easy processing black in the recipe, tires dissipate heat . . . take a tremendous amount of bending and flexing . . . withstand today's tough driving conditions.

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news of the rubber world

The rubber world has reawakened after the somewhat slow summer. Malaya is the scene of almost a full month of conferences on various facets of natural rubber and its technology; while here in New York, on the other side of the globe, the Rubber Division, ACS, holds its fall meeting. In October the scene shifts to Europe, with meetings in West Berlin, London, and Holland. October in the United States will also be very busy with rubber groups, ASME Erie Section, and a joint Army-Navy-Air Force Elastomer Conference providing considerable activity for stay-at-homes.

A belated "Happy Birthday" to The Firestone Tire & Rubber Co. which celebrated its sixtieth anniversary on August 3. The company has grown from 12 employes in the early 1900's to a present-day 90,000 employes.

World politics continue to cause problems for the rubber industry in many parts of the free world. In the Congo, all indications are that this year's natural rubber harvest will not be made and will be lost completely. Meanwhile, in Cuba, as we went to press, the U. S. Embassy in Havana reported that it had been informed that the workers' militia seized the plants of U. S. Rubber, Goodyear, and Firestone.

Also, as we went to press, FDA issued a list of rubber compounds and ingredients exempt from 1958 law. (See next issue.)

B. F. Goodrich won a consent decree from the Government withdrawing its suit against the patent for the Goodrich process for making cis-polyisoprene "Ameripol SN" which the Government had claimed had been developed under a federal research contract. Goodrich promptly announced plans to grant licenses to any interested manufacturer.

Our cover this month shows how good engineering in rubber can meet an old persistent problem. (See also page 101.)

news from abroad

Malayan Producers Create Advisory Group

The Malayan natural rubber producers have established a high-level advisory body, the Coordinating Advisory Committee, to aid worldwide expansion of natural rubber research,[1] the Natural Rubber Bureau announced.

This Committee is headed by Sir Geoffrey Clay, the Malayan natural rubber industry's Controller of Rubber Research. The group also includes seven scientists, one of them W. E. Cake, the United States Rubber Co.'s vice president in charge of coordinating research and development, and eight representatives from rubber production, business, and government.

Purpose of the committee is to advise the Malayan Rubber Fund Board on programs to be carried out by its three research groups, the Natural Rubber Producers' Research Association, the Rubber Research Institute of Malaya, and Rubber Technical Developments, Ltd.

Sir Geoffrey, speaking at the Committee's first meeting, reported his industry is now spending $4,000,000 a year on research and development and added, "It is the aim of the Malayan Government and the Rubber Producers' Council to make the natural rubber industry one of the most progressive basic industries in the world. . . .

"The potentialities for future development may well prove as great in the field of natural rubber as that of synthetic," he said, stating that trees currently being planted in Malaya will produce three and four times today's yield. Applications of hormones to stimulate yields is one of the possibilities revealed by research to date, he added.

Sir Geoffrey declared that experience over the last few years has indicated that the supply of natural rubber will be hard put to fulfill its share of rising world demand for rubber and explained that technical service to manufacturers is being expanded rapidly to help them choose the right rubber for any given job in order to utilize the natural rubber supply with most efficiency.

He disclaimed any dispute for supremacy between natural and synthetic rubbers, arguing that industry needs both rubbers, and that what is shaping up is "a progressive partnership" between the two types of rubbers.

[1] RUBBER WORLD, Apr., 1960, p. 8.

Red Retread Methods Years Behind U. S.

Polish retread techniques are 25 to 30 years behind the times, Glen Howard, sales administrator of Bacon American Corp., Muncie, Ind., reported after visiting privately owned retread shops and a large government operation in Poznan.

Writing in the August issue of *Modern Tire Dealer,* Howard described his experiences while running his company's exhibition of retread equipment at the twenty-ninth International Trade Fair in Poznan last June.

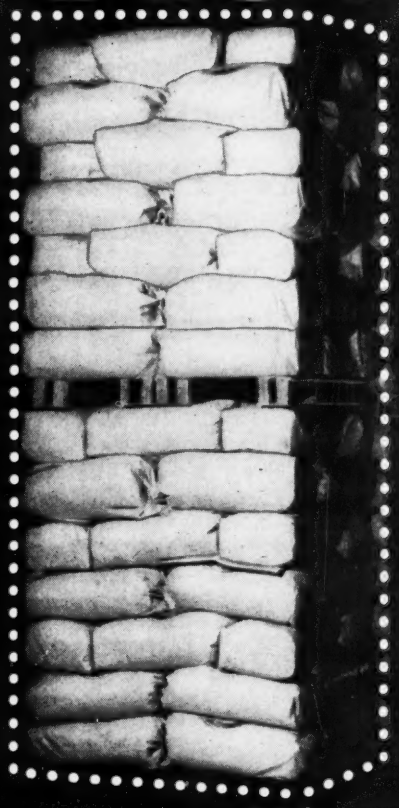
"In visits to three privately owned retread shops plus a large operation owned by the Polish government, I saw equipment so ancient and outmoded that I couldn't believe my eyes," he reported.

Howard wrote that the tread rubber in the government-owned Bolechowo

The Malayan Natural Rubber Producers' Coordinating Advisory Committee held its first meeting recently at the London headquarters of the Natural Rubber Bureau. Present, *left to right*, were: P. O. Wickens, Committee secretary; H. B. Egmont Hake, chairman, and E. D. Shearn, vice chairman, of the research and development committee of the Rubber Growers' Association; E. A. Murphy, director of research, central research division, Dunlop Rubber Co., Ltd.; Sir Harry Melville, polymer chemist; L. Bateman, director of the Natural Rubber Producers' Research Association; Sir Geoffrey Clay, chairman of the Committee, Controller of Rubber Research for the Malayan rubber producers and chairman of the Malayan Rubber Fund Board; C. E. T. Mann, former director of Rubber Research Institute, Malaya; D. J. Flunder, general purchasing manager, Dunlop's Materials Supply Division; R. B. Carey, former Member for Works, Federation of Malaya; J. G. Mackay, chairman, Francis Shaw & Co., Ltd.; Sir Eric Rideal, former professor of colloid chemistry, Cambridge University, and E. Jago, London representative of the Malayan Rubber Fund Board

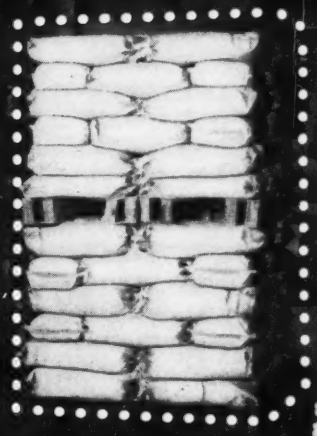
PROTOX®-267

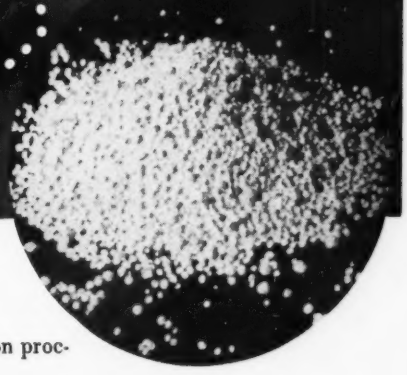
ZINC OXIDE



Two units on left contain 84 bags—
2.1 tons conventional zinc oxide.
(Each unit 6 bags per layer, 7 layers high.)

Two units on right contain 96 bags—
2.4 tons Protox-267 zinc oxide.
(Each unit 8 bags per layer, 6 layers high.)





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It saves dollars!

You will save on unloading costs. You will save on storage costs. You will save on processing costs.

PROTOX-267 bulks about half that of conventional zinc oxides. A 50-pound bag occupies less than 1 cubic foot of space. It flows freely . . . can be weighed out faster. Long before the pigment enters your processing operation you can start counting your savings.

But the most important savings come from PROTOX-267's faster incorporation and dispersion in rubber. The unique coating* of zinc propionate on the pigment particles makes for rapid and thorough dispersion. There are no aggregates . . . no undispersed pigment . . . no spotty cures.

And keep in mind . . . PROTOX-267 is a member of the HORSE HEAD line of zinc oxides. That also makes it the *most uniform* zinc oxide you can buy.

Do you have the 24-page booklet on PROTOX zinc oxides? It's chock-full of facts every rubber chemist and purchasing agent should know. A post card will bring you a copy.

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U.S. Patent 2,303,330

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Retread Shop was very crude and difficult to work and, judging by the color, was short on carbon black. The extruded material sometimes varied by as much as a quarter inch in thickness in a two-foot length, he said.

He noted also that the tread designs and curing equipment were very old, and the retreading operations primitive. Cementing and drying alone take more than 14 hours.

Howard said that the Bolechowo shop imports its casings to be retreaded from England, because the English casings contain nylon or rayon cord; whereas the Polish casings have cotton cord. The casings used were worn almost down to the cord, he revealed, adding that no American recapper would retread 90% of them.

Primitive as the government shop was, those of the private retreaders were even more so, Howard reported.

"They (the Poles) will need a good many five-year plans before they begin to turn out tires on the same scale—and quality—as any ordinary American shop," he concluded.

Natural Rubber Groups Expand Research Work

The natural rubber industry has intensified research "to define and insure the most advantageous, efficient, and economical use of its product," Leslie Bateman, director of the Natural Rubber Producers' Research Association (formerly the British Rubber Producers' Research Association) told 60 leading British scientists and technologists at a symposium held by the Association, July 6 and 7.

The symposium, on "Fundamentals of Failure Phenomena in Rubbers," was held at the Association's Welwyn Garden City laboratories just outside London.

Dr. Bateman, who called natural rubber "unquestionably the premier general-purpose elastomer," told the group that "recent developments have recently mitigated certain limitations imposed by its chemical reactivity."

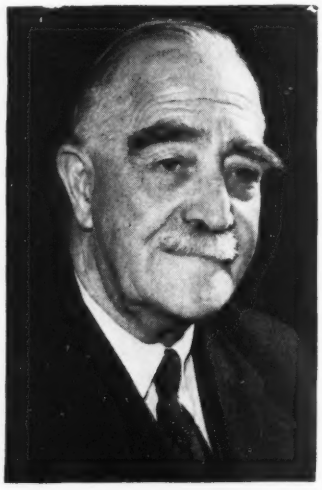
He said that rubber producers of Malaya have materially increased their agricultural research at the Rubber Research Institute, Kuala Lumpur, Malaya, their applied and fundamental work at the Natural Rubber Producers' Research Association's Welwyn Garden City laboratories, and their technical service work in the United States. A new technical service division was added to the Natural Rubber Bureau in the United States for this purpose, he added.

Dr. Bateman noted that in addition to the change of the name of the British Producers' Research Association to the Natural Rubber Producers' Research Association as of July 19, the Natural Rubber Development Board has changed its name to the Natural Rubber Bureau.

P. D. Brass, *center*, research representative of the United States Rubber Co., enjoys a coffee break, with A. Schallamach, *left*, of the Natural Rubber Producers' Association, and J. Rogerson, *right*, of British Insulated Callender's Cables, Ltd., at the Association's two-day symposium

Symposium talks included the following:

Basic Factors Determining Tear Resistance, by L. Mullins; Rupture Processes during Cut-Growth and Flex-Cracking, A. G. Thomas; Fatigue as a Cut-Growth Phenomenon, P. B. Lindley; Stress Relaxation Studies of Oxidative Aging, J. R. Dunn; New Approaches to the Protection of NR against Oxidative Aging, S. G. Fogg; Mechanics of Ozone Cracking; Physical Aspects of Antiozonant Functions, M. Braden and D. Barnard.



C. B. Copeman, chairman of Maclaren & Sons, Ltd., publishers, has received the Hancock medal of 1960 by the Council of the Institution of the Rubber Industry for outstanding services to IRI and the industry

New Latex Patents Cover Preservatives

Planters' Bulletin (July, 1960) calls attention to British patents Nos. 800,089 and 821,872—both covering preservation systems for latex concentrates—which have been obtained by the British Rubber Producers' Research Association on behalf of the Rubber Research Institute of Malaya. In the first process, latex concentrate of approximately 60% D.R.C. is preserved with 0.1 to 0.2% weight, of ammonia, and a secondary addition of 0.1% weight of sodium pentachlorphenate, together with a sequestering agent, such as ethylene diamine tetracetic acid.

The second patent specifies the use of 0.1% of one of the selenium compounds of dithiocarbamic acid, such as selenium dimethyl dithiocarbamate or selenium diethyl dithiocarbamate, together with 0.2% weight ammonia. This system was developed by K. C. Sekhar, formerly of the RRI chemical division.

Varnish for Rubber Footwear Developed[1]

Studies were undertaken in Russia to develop a suitable varnish for rubber footwear based on non-vegetable raw materials, based on the oxidation of solutions of sodium butadiene rubber. Best results seem to have been obtained with a 12% solution of the rubber in benzine varnish, oxidized at 120° C. under continuous circulation of air. The process takes about 16 hours, and a product results which has viscosity of slightly under 20 cp. In order to accelerate oxidation and lower the temperature, various additives were tested; the only satisfactory results were obtained with 3.5 phr. of iron oleate or stearate, when the proper viscosity was reached at 100° C. after eight hours (instead of 15-16 hours at 120° C.). During oxidation the iron combines completely with the rubber—a reaction still being studied.

Tests show that the quality of the varnish depends to a high degree on oxidation time and that the lowest possible viscosity gives the best results; curing time also is a factor where unvulcanized shoes are treated.

Useful results in cutting drying time of molded rubber footwear varnished after vulcanization were achieved by adding about 2% sulfur and thiuram, 4% butyl zimate, or 2% carbon black to the solution in presence of iron stearate.

Varnishing rubber footwear with oxidized solutions of sodium butadiene has been introduced at the Krasnye Bogatyr works and is considered to be of great economic advantage.

[1] *Plaste Kautschuk*, Apr. 1960, p. 182.

(*Continued on page 16*)

Photographed with the cooperation of Hofran, Inc., Tampa, Florida

Your business could "mushroom," too – with PLIOFLEX!

The idea was sound: A traffic "mushroom" of colored *rubber* that would "give" when hit – wouldn't chip, crack or spall, wouldn't hurt tires or rims, wouldn't need painting.

The way it was put into practice was sound, too: *Molded* of PLIOFLEX 1773 – light-colored, oil-extended synthetic rubber—*toughened* with PLIOLITE S-6E—easy-processing, reinforcing resin—and *protected* against age and discoloration by WING-STAY S—top-flight, nonstaining antioxidant. (All from Goodyear, of course.)

The net result: A long-lasting, low-costing marker that's fast gaining popularity with highway departments.

Why don't you think of rubber in new terms, too? And when you do, be sure it's PLIOFLEX. If you need any help, just write Goodyear, Chemical Division, Dept. U-9418, Akron 16, Ohio.

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GOODYEAR

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Plioflex, Pliolite, Wing-Stay – T. M.'s The Goodyear Tire & Rubber Company, Akron, Ohio

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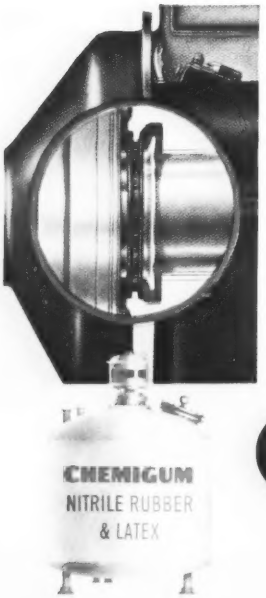
Another "seal of approval"—won with CHEMIGUM!



A long-time problem to automotive engineers and designers was the leaking of oil from rear main bearings. Seals of leather, fiber, metals and other materials just didn't do the right job.

Exhaustive study by a leading manufacturer led to a series of specially designed seals made with CHEMIGUM. CHEMIGUM was chosen because of its outstanding resistance to oil and heat, its toughness and abrasion-resistance and its processability that permitted easy production of smooth, close-tolerance, tight-sealing rings.

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Photograph taken through the cooperation of Acushnet Process Company, New Bedford, Mass.

WING-STAY 100 checks the effects of oxygen—and ozone

It's no easy task to develop a good brake cylinder boot compound.

Part of the problem is the frequent flexing under exposure to hydraulic fluid and heat. But equally important are the effects of oxygen and ozone degradation.

A happy solution was found by one leading manufacturer in the form of WING-STAY 100. This triple-action chemical (stabilizer, antioxidant *and* antiozonant) proved most effective against atmospheric attack in extensive laboratory and field tests. Moreover, it displayed excellent processing qualities.

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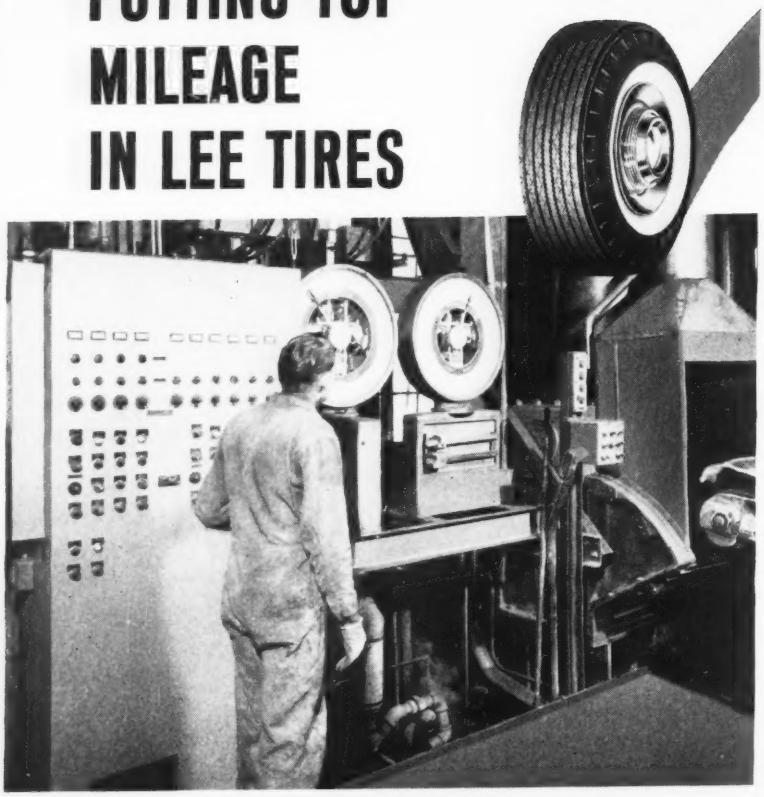
Wing-Stay—T. M. The Goodyear Tire & Rubber Company, Akron, Ohio

PUTTING TOP MILEAGE IN LEE TIRES



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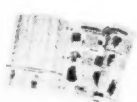
Error-free batching that makes each tire good for maximum mileage... that's what Richardson Formula Capsules and Select-O-Weigh batching system are doing for Lee Rubber & Tire Corporation. In addition, Lee gets quick-change formulation for carbon blacks and oils simply by replacing one formula capsule in the control panel with another. Capsules are pre-set in the laboratory and control entire batching operation, including Banbury... check weight within a given tolerance ...never miss an ingredient... don't get tired... don't miscount. Whether it's ingredients for rubber or other products, Richardson Formula Capsules and Select-O-Weigh systems can do this for **you,** too. Why not write or phone us about **your** batching problem? **Richardson Scale Company, Clifton, New Jersey.**

Send for free technical bulletin.



RS-4

Richardson

Sales and Service Branches in Principal Cities
Also manufactured in Europe to U.S. standards
Richardson Scales conform to U.S. Weights and Measures H-44 for your protection.

MATERIALS HANDLING BY WEIGHT SINCE 1902

(*Continued from page 12*)

Malayan Research on Latex, Ground Covers

The Journal of the Rubber Research Institute of Malaya,[1] contains four interesting articles. The first— by A. S. Cook— discusses the value of various anti-coagulants to keep field latex in a liquid condition for a few hours on the day of tapping and for a period of 24 hours, while at the same time giving a good quality sheet. Formaldehyde seems to be the most useful preservative for use over the shorter period; for latex that must be kept liquid for 24 hours, the cheapest and most effective combination appeared to be formaldehyde with sodium metasilicate. Cook emphasizes that preservation is influenced by the type of latex, weather, season, and similar factors.

In the second article, P. R. Wycherly reports on experiments with ground covers on rubber estates, results of which indicate that prolonged cultivation with modern methods of upkeep has impoverished the flora, thus increasing the risk that undesirable vegetation will predominate. Wycherly also reports (in the fourth article) on the influence of methods of treating seed on the germination of various legumes used as ground covers in the tropics.

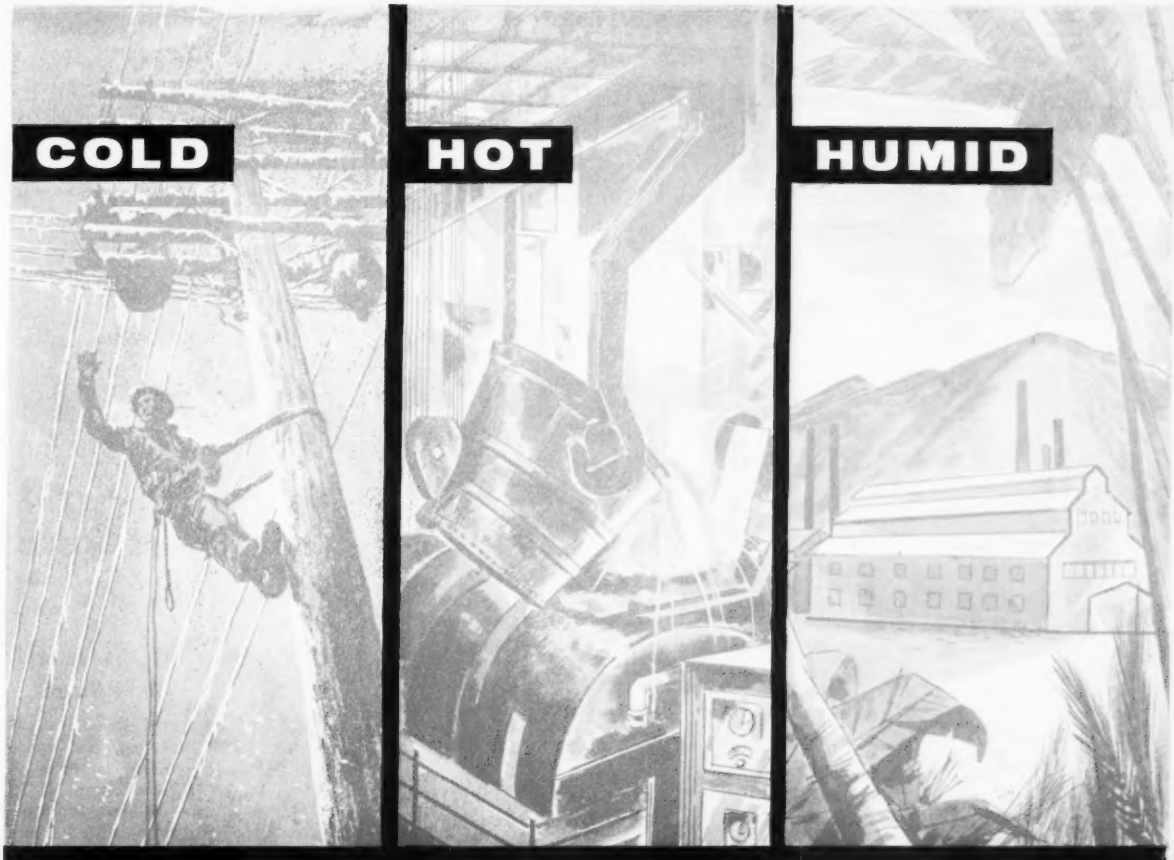
The effects of storage, ammonia concentration and temperature, on the values obtained for particle size of latex by the soap titration method are described by B. C. Sekhar in the third article. Temperature has a marked influence on results; there is no direct relation between particle size and mechanical stability of latices, but there is a relation with nitrogen content, and there is a definite trend toward increased particle size during wintering. High-speed mechanical agitation does not cause immediate agglomeration of particles, and it is shown that the ASTM mechanical stability test is not a measure of the onset of agglomeration of particles, but probably is a measure of the approximate time to attain visible particle size.

[1] Vol. 16, Part 2 (1960).

Malayan Exports Drop

The drop in exports of rubber from Malaya, noted in June, continued in July, with shipments in the latter month the lowest since September, 1958. Total exports for the first half of 1960, at 544,417 tons, were 5% less than for the same period last year; the 627,233 tons shipped out in the first seven months of the current year were 8% below the corresponding 1959 figure.

At the same time, outputs for the first six months of 1960, totaling 336,407 tons, represented a gain of 3% over those reported for the 1959 period.



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In frigid northern climate or in the humid tropics . . . for use with hot industrial machinery or with telephone wires . . . electrical insulation compounds, modified with Marbon 8000 AE resin give superior performance.

This hydrocarbon resin also offers proven production advantages: fast, smooth extrusion at lower mixing temperatures, with less scorch . . . good resistance to heat aging . . . high tear and cut resistance . . . low moisture pick up . . . maximum electrical properties and flexibility of compounding with reduced overall cost.

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DIVISION **BORG-WARNER**
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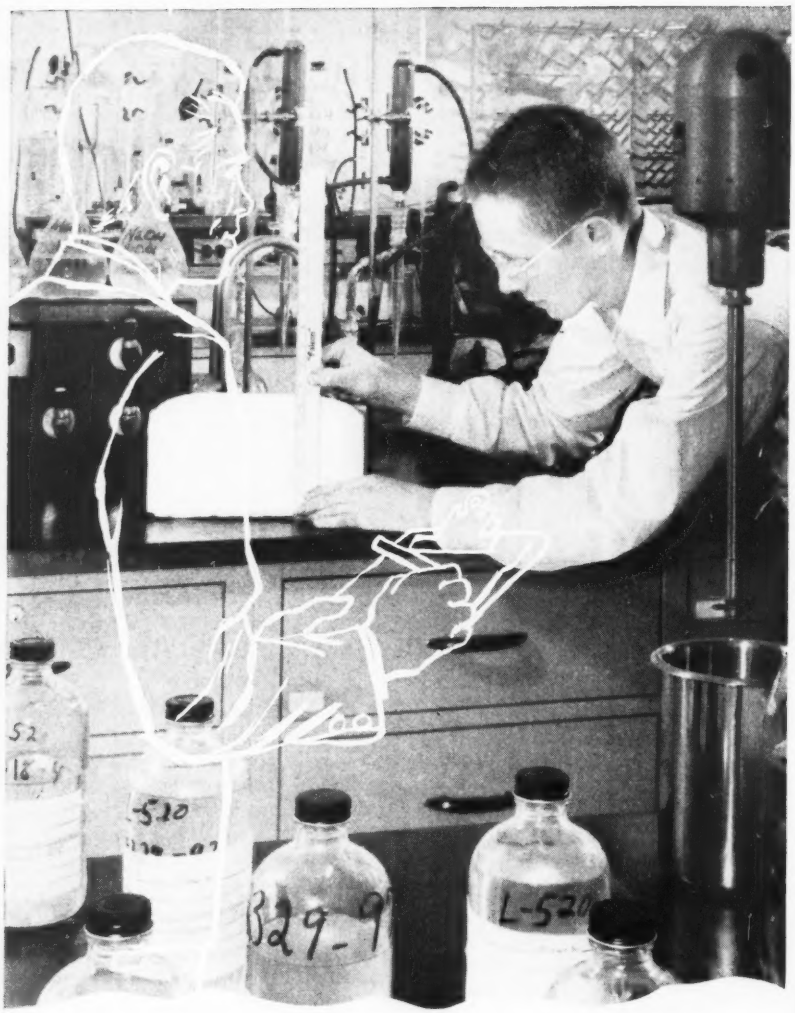

HOW THE SILICONES MAN KNOWS...

YOUR ONE-SHOT FOAM SURFACTANT IS ALWAYS UNIFORM

Every production batch of UNION CARBIDE L-520 Silicone Surfactant for one-shot polyether foams is thoroughly laboratory tested. This way, your Silicones Man can be sure it is *always uniform in the properties important for foam production.*

Tests are made on a standard one-shot foam formulation. The L-520 must meet minimum requirements for foam rise, settling at the height of the rise, foam uniformity, and freedom from splits.

True, a bench test cannot duplicate the varying production conditions encountered in plants all over the country. But it does assure you of constant uniformity in the significant surfactant properties. It has done much to help bring about widespread acceptance of the one-shot process where once there was hesitation.

For complete data, write Dept. IS-4002, Silicones Division, Union Carbide Corporation, 30 East 42nd St., New York 17, N.Y. *(In Canada:* Union Carbide Canada Limited, Toronto 7.)

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news from abroad

Erich Konrad

Erich Konrad Awarded IRI Colwyn Medal

Erich Konrad, former director of the Leverkusen Laboratories, Farbenfabriken Bayer, has been awarded the Colwyn Medal, highest honor of the Institution of the Rubber Industry, London, England. The Medal was granted especially for work in the field of synthetic rubber development.

Dr. Konrad, a researcher in the field of high polymer chemistry at the Chemical Institute of the University of Freiburg, turned toward study of the chemistry and technology of rubber in 1927 with his appointment to Bayer. His work resulted in the setting up of synthetic rubber plants as early as 1936 and was recognized by award of the gold medal of the Committee of the International Exhibition in Paris in 1937. His work is considered one of the foundation stones on which today's synthetic rubber industry is built.

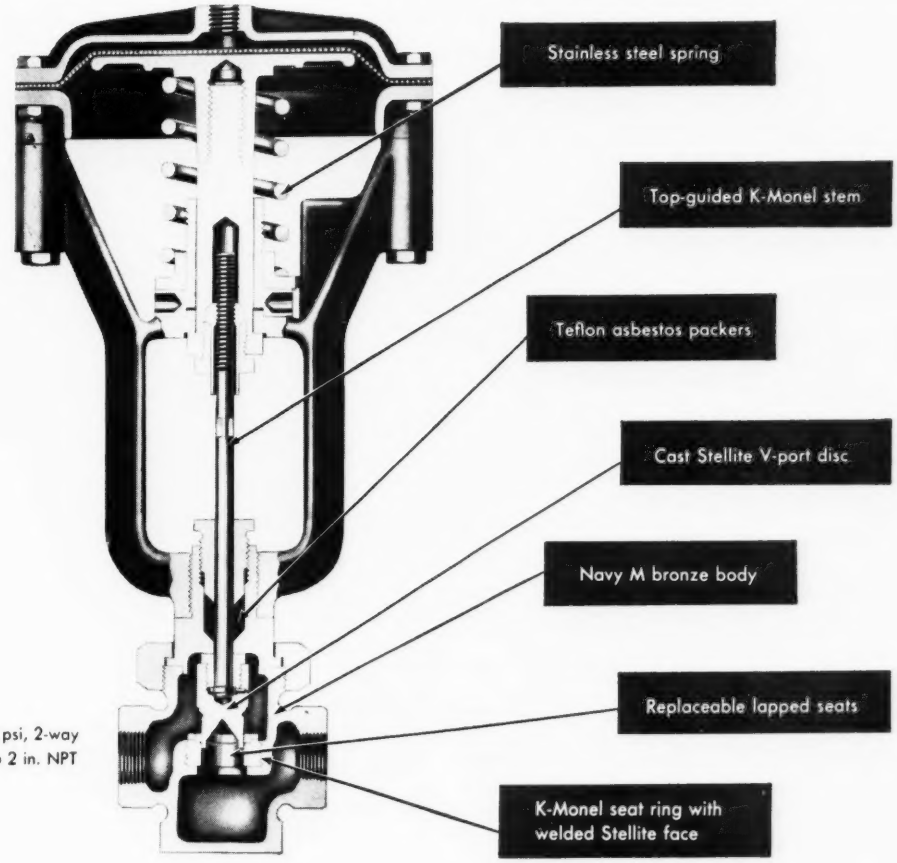
Pelletized News

Polybutadiene is to be produced in Berre, southern France, by the Société des Elastomères de Synthèse. This company, formed early last year by the Royal Dutch Shell Group, together with Cabot Texas Butadiene, Michelin, Dunlop, and Kleber-Colombes, is already building a factory at Berre for SBR, which is scheduled to go on stream next year and has a capacity of 50,000 tons. The polybutadiene plant at Berre will have annual output capacity of 25,000 tons.

Seven Sumatra rubber plantation companies of Harrisons & Crosfield Co.,

(Continued on page 142)

SINCLAIR-COLLINS® V-PORT VALVES



. . . for precise control of pressure or temperature . . . steam, hot or cold <u>raw</u> water service

Sinclair-Collins' V-port valves offer a solution to your temperature or pressure modulation problems. Designed for instrument actuation, they offer variable metering to provide extremely accurate and consistent control of media flow rates. Highest quality materials and Sinclair-Collins' precision manufacturing methods assure long, reliable service life, with minimum maintenance downtime. Stainless steel trim resists corrosion . . . Stellited seat ring and port disc resists wire drawing and cutting. Find out how S-C V-port valves can meet your control needs . . . a call to your near-by Sinclair-Collins Field engineer will bring prompt application engineering recommendations.

For more information write for free Bulletin SC-59. Address: Sinclair-Collins Valve Company, Akron 9, Ohio, Dept. RW-960

The SINCLAIR-COLLINS VALVE Co.

DIVISION OF INTERNATIONAL BASIC ECONOMY CORPORATION (IBEC)
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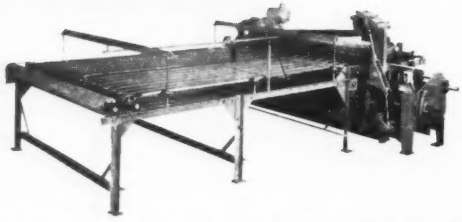
8117

ALFA CUTTERS

3 Precision-Built Machines Designed For A Wide Variety of Cutting Jobs!

AUTOMATIC STOCK CUTTER



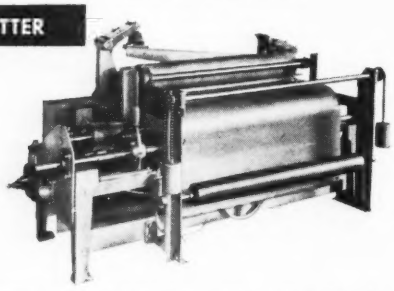
• A high production, self-contained machine, the Alfa Stock Cutter is complete with motors, variable speed control, synchronizer and conveyors. Measures and cuts to length a continuous material flow from processing machines or yardage rolls.

Quickly and easily adjusted to cut infinite lengths. A clean accurate cut is assured and design is flexible to suit conditions.

Sizes: 30″ — 42″ — 60″ — 72″ — 84″ — 90″.

BATT CUTTER

Cotton
Fiber-Glass
Felts
Padding
Plastics
Rubber



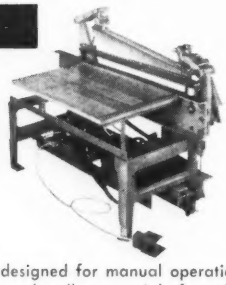
• For automatic cutting of yardage rolls or may be synchronized to a continuous processing line. Accurately cuts wide range of materials — battings, plastics, textiles, paper, rubber stock and sponge. Fully self-contained, the machine is complete with motor and synchronizer and meets a wide range of cutting problems.

Length of cut is variable and easily regulated by quick change gears or other means depending on requirements.

Sizes: 30″ — 42″ — 60″ — 72″ — 84″ — 90″.

ELECTRIC POWER SHEAR

Rubber
Foam
Sponge
Vinyl
Paper Board
Textiles



• A compact heavy duty machine, designed for manual operation. Ideal for many cutting requirements — handles materials from flat folds, rolls or sheets. The clamp is automatic and adjustable for pressure and clearance. The table is heavy wood construction with metal straightedge. The foot switch activates the knife and can be placed in any position convenient to the operator.

Sizes: 36″ — 48″ — 60″

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SOUTH NORWALK, CONNECTICUT • Phone: VOlunteer 6-3394
Illinois Office: P.O. Box 328, LaGrange • Phone: FLeetwood 4-4811
Representative for Alfa Machine Co.

Compensator permits direct psi. tensile readings

New Scott Accessory

A new specimen dimension compensator which automatically adjusts tensile test recordings for dimensional changes in specimen thickness, width, diameter, or cross-section has been introduced by Scott Testers, Inc., Providence, R. I. The compensator, designed for use with Scott Model CRE electronic testers and Scott Accr-O-Meter conversion kits, provides a fast, accurate means of obtaining tensile test recordings direct in psi., kgs/cm^2, or other selected bases, it is claimed.

Stacking Truck Platform

A removable, rider platform has been developed for use with a standard, narrow-aisle, high-stacking Model MN AisleMaster, Lewis-Shepard Products, Inc., Watertown, Mass., has announced.

A full set of controls for steering, lifting, lowering, and driving is located on the platform, allowing the standard MN truck to be used for regular right-angle stacking operations without the platform, but also allowing the driver to ride up to storage areas to remove or deposit goods with the platform in position.

Waldron Reverse Roll Coater

A new reverse roll coater, the Waldron Model RA, has been added to the line of standard coating machines manufactured by Waldron-Hartig Division of Midland-Ross Corp., New Brunswick, N. J.

CLOSE TOLERANCES REQUIRE ROYLE "CONSTANT PRESSURE" ROLLER FEED HOPPERS

No. 1 Royle Extruder for Rubber with Roller Feed Hopper.

With a ROYLE "Constant Pressure" Roller Feed Hopper, mechanical rubber goods and insulated wire can be produced to extremely close tolerances.

There are many advantages to using a "Constant Pressure" Roller Feed Hopper:

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Increased Production through High Speed and Less Waste

Labor Saving

Royle "Constant Pressure" Roller Feed Hoppers are suitable for all sizes of extruders.

As they have since 1880, Royle is first in Extruder development.

Use this coupon for full information about the NEW Royle "Constant Pressure" Roller Feed Hopper.

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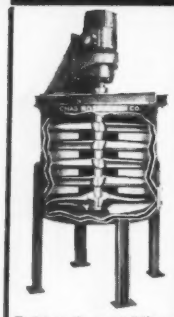
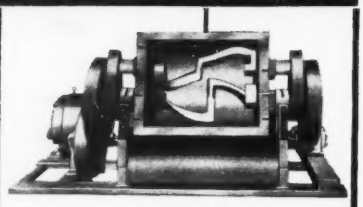
gives better results in less time!

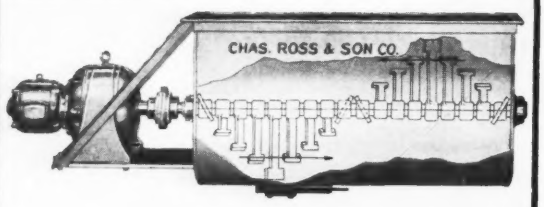


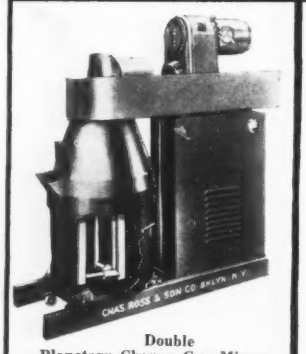
Rubber Cement Mixers
100 - 1000 Gal. sizes



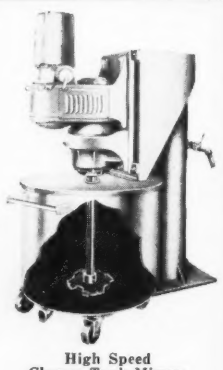
Heavy Duty Double Arm Kneaders
1 pint - 150 Gal. sizes

Rubber Reclaiming Mixers
100 - 1000 Gal. sizes

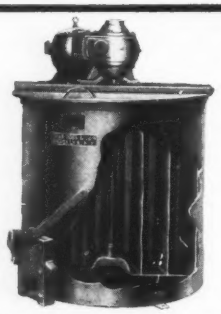




Double
Planetary Change Can Mixers
1 - 150 Gal. sizes



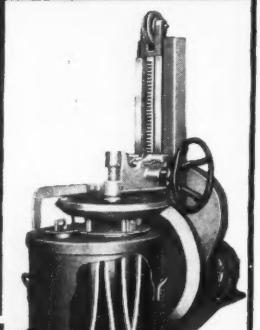
High Speed
Change Tank Mixers
80 - 250 Gal. sizes



Heavy Duty Paste Mixers
25 - 1000 Gal. sizes

Also Dry Crushing and Pulverizing Mills, Three Roller Mills, Hopper Mills, High Speed Dissolvers or Dispersers, and Mixers of all types for Dry, Liquid, Paste and Heavy Paste Materials.

Write for complete information!

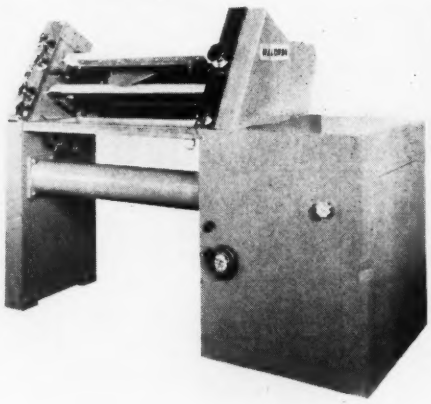


Heavy Duty
Change Can Mixers
8 - 60 Gal. sizes

CHARLES ROSS & SON COMPANY, INC.

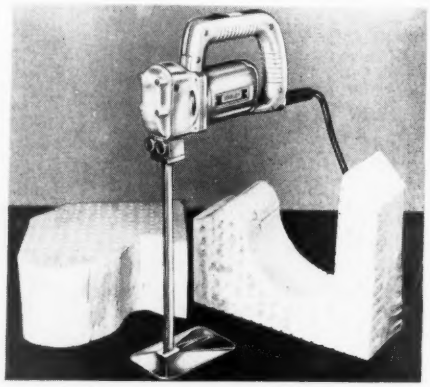
148-156 (W) Classon Avenue, Brooklyn 5, N.Y.

new equipment



New roll coater which has been designed for pilot-plant and production processes

The Model RA is designed for narrow- and medium-width pilot-plant and production processes for web widths up to 48 inches, according to the company. Of heavy steel frame construction, this coater has complete and centralized controls for ease of operation, accurate and repetitive metering adjustments, pneumatically loaded backing roll, and simplified removal of coating rolls, it is claimed.

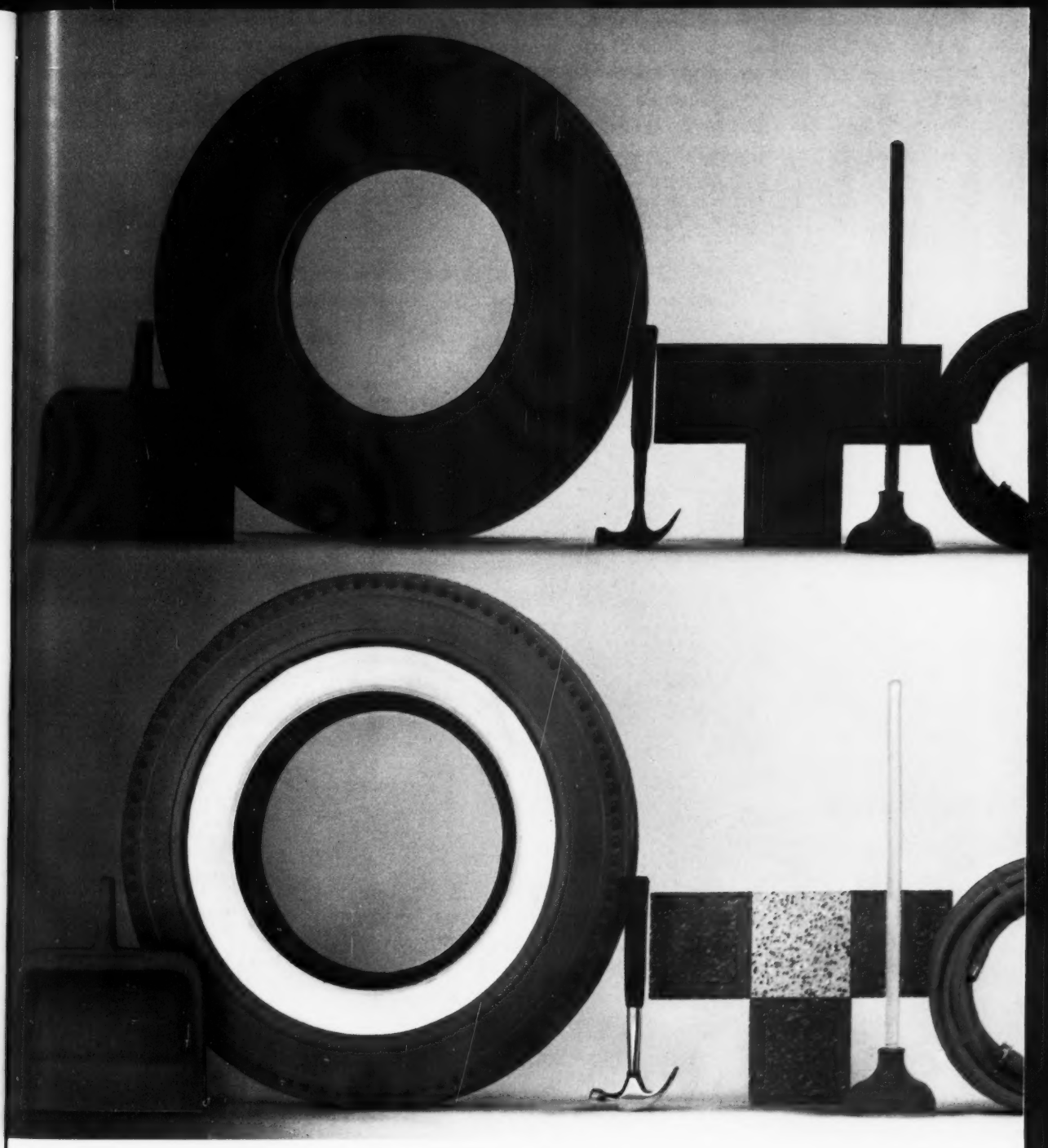


New foam-rubber cutter

Stanley's Foam-Rubber Cutter

Stanley Electric Tools, division of The Stanley Works, New Britain, Conn., has introduced a new line of heavy-duty foam-rubber cutters for precision cuts up to 12 inches. The tools, designed for industrial use, come in blade lengths of six, nine, and 12 inches.

Each unit is designed so that the blade can be lifted out or replaced quickly, according to the manufacturer. With the regular base plate the cutter is used for right-angle cuts, and a small-curved base plate is available as an accessory for bevel cuts.



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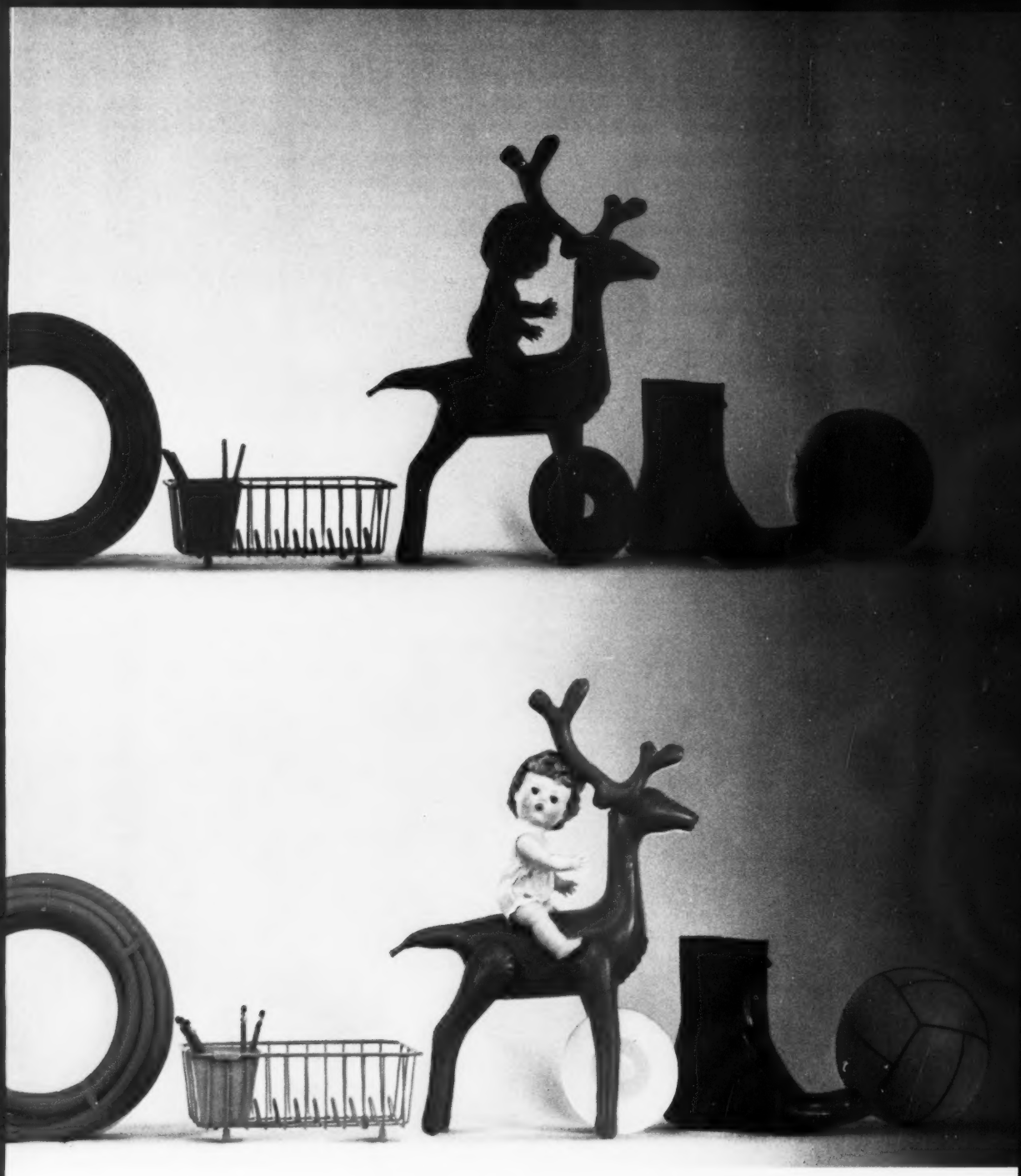

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Lively, clean colors help move consumer goods from shelf to buyer. Watch your customers buy color! Soft, subtle pastels . . . smart, vivid brights . . . deep, rich tones. Any color in the spectrum can be yours when you use Columbia-Southern white reinforcing pigments.

And any level of general properties or specific physicals is obtainable with straight or combination loadings of Calcene, Silene and Hi-Sil.

For the less glamorous industrial mechanical or molded goods producer, color can code or distinctively identify product brands at moderate cost.

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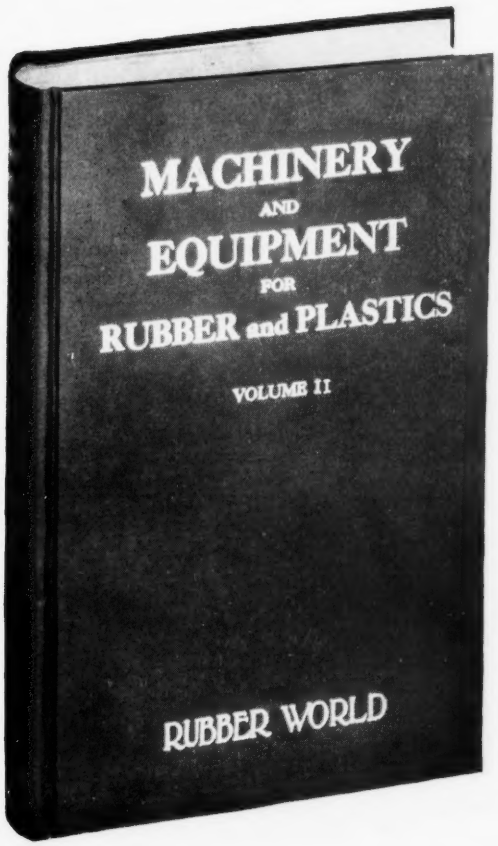

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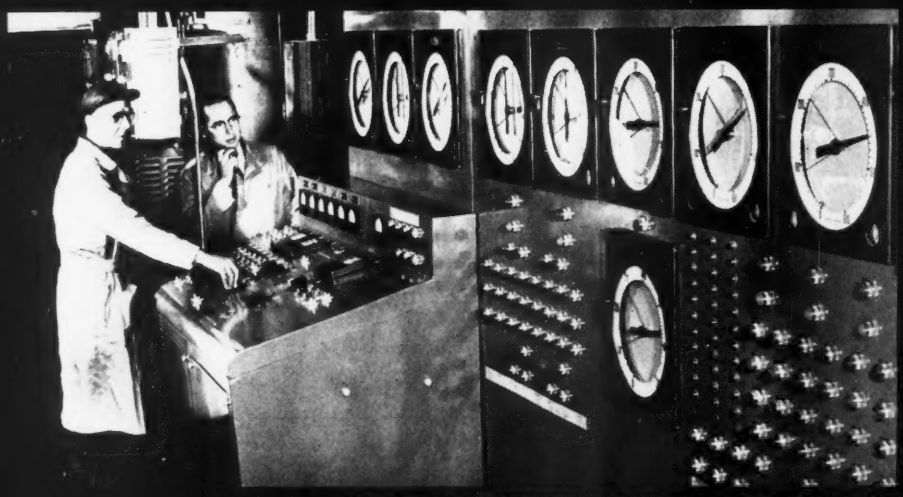

Control Center — Calendar Treating Line Photo courtesy Armstrong Rubber Manufacturing Co.

Whether the simplest kind of equipment installation — or the world's first triple-zone rayon/nylon calendar line as shown here — the moment of startup is the culmination of months of calculation and construction . . . an inexorable test of soundness of engineering, skill of manufacture and field erection.

This unique new process line — highly advanced in operation and control — performed at startup, and after a brief two-week testing and minor adjustment period exploring the multiple operating possibilities, went into full-time production at 60 ypm.

Achieving anticipated operating results from the moment of startup is the rule with Litzler fabric treating lines and units. "Our plant engineer reports that the unit has operated very satisfactorily since the time of its installation"* . . . and "Having completed the installation of the subject machine, we want to express our satisfaction at the way it is working and at first results"* . . . are typical judgements of owners.

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the rubber industry can

POLYMERIZATION

with

HYDROXYLAMMONIUM SULFATE

Hydroxylammonium Sulfate—$(NH_2OH)_2 \cdot H_2SO_4$—is an excellent non-discoloring short stopper for use with peroxide-catalyzed polymerizations. It is used in the production of butadiene-acrylonitrile rubber and other polymers.

Physical Properties	HYDROXYLAMMONIUM SULFATE
Formula	$(NH_2OH)_2 \cdot H_2SO_4$
Molecular Weight	164.14
Melting Point, °C	177*
pH of 0.1 M Aqueous Solution at 25°C	3.7
Solubility in 25°C, g/100 g solvent	
In Water	63.9
In 95% Ethanol	0.2
In Methanol	0.1

*Melts with decomposition.

"HS" destroys the peroxide polymerization catalyst as soon as polymerization has progressed to the desired stage. Products of decomposition are oxides of nitrogen which do not remain in the final product. "HS" is adaptable to both hot and cold polymerizations.

Some reports indicate improvement of rubber quality when "HS" is used. It has been found, too, that on a cost-efficiency basis, Hydroxylammonium Sulfate actually is more economical than some commonly used short stoppers.

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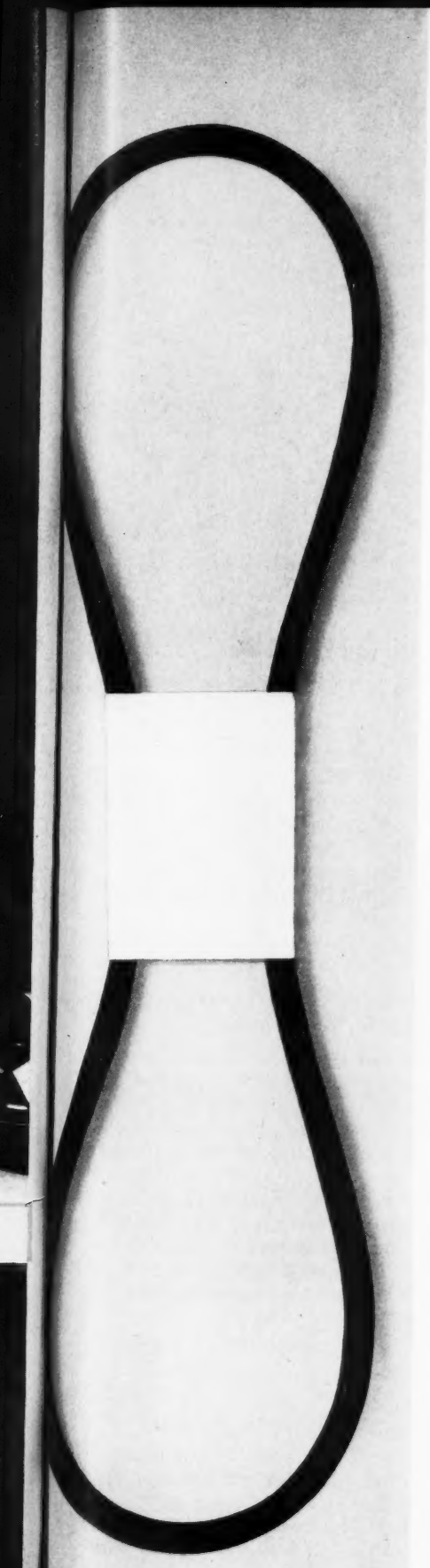
IN CANADA: McArthur Chemical Co. (1958) Ltd., Montreal • IN MEXICO: Comsolmex, S.A., Mexico 7, D. F.

AUTOMOTIVE HEAT



Gen-Tac®

the universally-accepted cord adhesive

helps win the battle against speed and heat

Gen-Tac solves the problem of achieving better rubber-to-cord adhesion to meet today's faster speeds and higher horsepower! This unique vinyl pyridine latex provides dynamic adhesion between rubber and rayon, nylon, dacron and other types of cord—helping make better belts than ever before.

If you manufacture fabric-reinforced rubber products, let us show you how you can improve them with Gen-Tac . . . write or call today for valuable information and technical data on this and other Chemical Division products.

Gen-Tac offers:

- Maximum rubber-to-cord adhesion
- Excellent freeze/thaw stability
- Improved dip processing
- Less squeeze roll build-up

Creating Progress Through Chemistry

Chemical Division GENERAL

THE GENERAL TIRE & RUBBER CO.

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CHEMICAL DIVISION · AKRON, OHIO

Chemicals for the rubber, paint, paper, textile, plastics and other industries: **GENTRO SBR** *rubber* **GENTRO-JET** *black masterbatch* • **GEN-FLO** *styrene-butadiene latices* • **GEN-TAC** *vinyl pyridine latex* • **GENTHANE** *polyurethane elastomer* • **ACRI-FLO** *styrene-acrylic latices* • **VYGEN PVC** *resins* • **KURE-BLEND** TMTD *masterbatch* • **KO-BLEND** *insoluble sulfur masterbatch*

RECLAIMATOR® RUBBER...

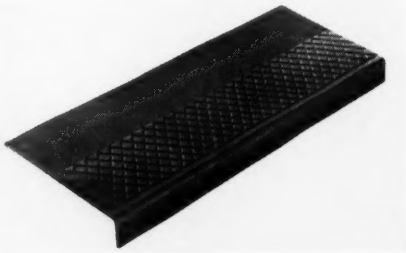
...stays young, too!

You can safely "scoot" on tires made with RECLAIMATOR rubber.

In a recent series of tests three leading tire manufacturers proved that RECLAIMATOR rubber adds WEATHER RESISTANCE to their tires. The tire sidewall compound contained 19% of reclaimed rubber, and RECLAIMATOR rubber was compared pound for pound with the best matching conventional reclaims. In a static test, tires were mounted on wheels, inflated to 30 lbs. pressure, and were exposed horizontally to sunlight, ozone and weather on a Los Angeles roof for 90 days. In a dynamic test, similar tires were driven in the area for 90 days. Results of tests show that tires made with conventional reclaim had many weather cracks on the sidewall, but sidewalls containing RECLAIMATOR rubber had practically none.

RUBBER RECLAIMING CO., INC.
P. O. BOX 365 BUFFALO 5, N. Y.

new products



New low-cost, molded rubber stair tread

Molded Rubber Stair Tread

A new low-cost, molded rubber stain tread has been introduced by The R. C. Musson Rubber Co., Akron, O. The new tread, No. 650 stair tread, is described by the manufacturer as being safety-designed with maximum resilience, slip-resistance, and noise reduction. The manufacturer further claims that the tread contains more pure rubber and less loading material than is customary and describes it as suited to hospitals, dormitories, apartment houses, hotels, or any institution where safety and absence of noise are especially desirable.

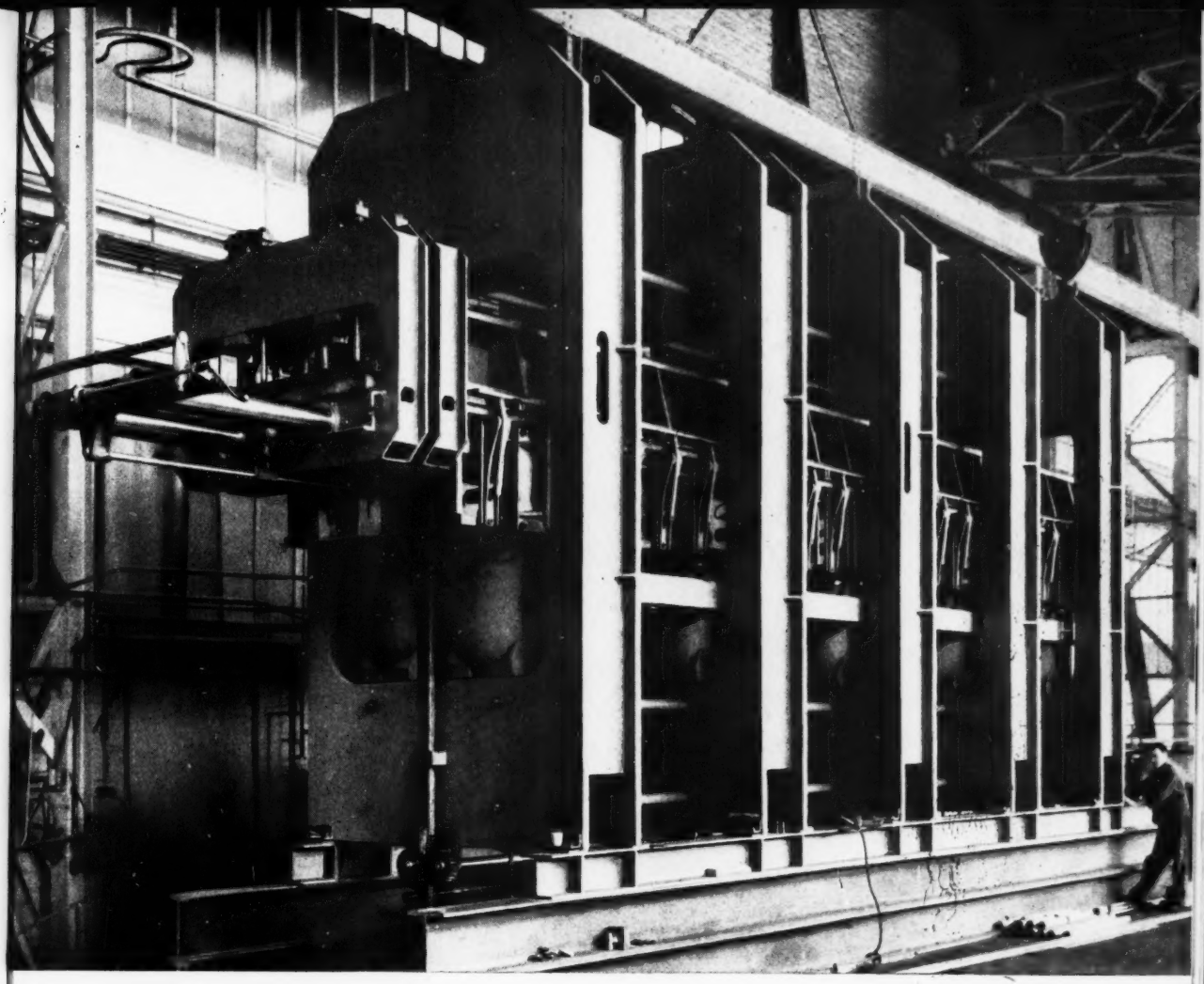
New Wire Finish

National-Standard Co., Niles, Mich., has developed a new surface finish for high-carbon steel wire used in reinforcing rubber goods. The finish, Adply-A, provides up to twice the adhesion with as good or better corrosion resistance as present finishes, the manufacturer claims. High-carbon steel wire with Adply-A finish is available from 0.012- to 0.050-inch in diameter and is recommended for high-pressure hose applications where the cost of brass-plated stainless steel is prohibitive but where liquor finish wire will not provide adequate corrosion protection, National-Standard says.

New Loading-Dock Bolsters

Door Gaskets, loading dock bolsters made of neoprene-coated nylon stuffed with shredded polyfoam, are being offered by Charles B. Cooper, Syracuse, N. Y., manufacturer's representative. Door Gaskets are made by C. M. Gibbs Co., Syracuse,

(*Continued on page 34*)



Leading rubber plants all over the world operate our

Hydraulic Belt Presses

We supply belting presses with a working width up to 10 feet.

Siempelkamp

G. Siempelkamp & Co. · Maschinenfabrik · Krefeld

West Germany

Telegrams: Siempelkampco · Telex No.: 0853811 · Telephone: 28251

The only explanation I have is that he must be in the neoprene business and knows that MAGLITE is the key to superior scorch protection.

You rave so much about how MAGLITE solved your scorch problems with neoprene, how was I to know that it wouldn't do the same for my cooking?

Merck gallery of experts

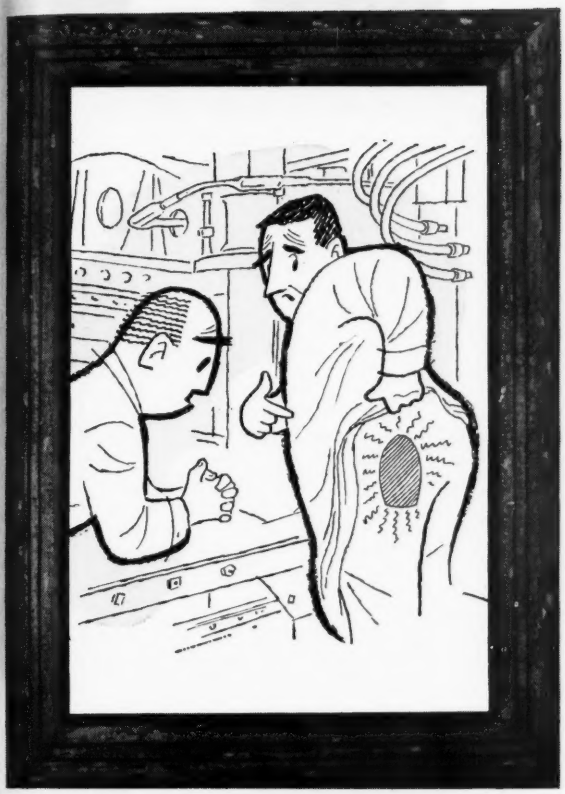
FOR BEST SCORCH PROTECTION THEY ALL AGREE ON

Maglite®

THE PERFORMANCE-PROVED MAGNESIUM OXIDE

Try MAGLITE D in your neoprene formulations. You'll agree with our cartoon "experts" that MAGLITE D offers better scorch protection for neoprene than any other magnesium oxide you can use. It also helps you solve storage problems since it occupies about one-third the space as many of the lightweight magnesias.

MERCK MARINE MAGNESIUM DIVISION



Now that we're using MAGLITE for neoprene, scorch is no problem here—but what can I do about it at home?

That fire-breathing routine can't cause scorch damage where I come from. We use MAGLITE, the performance-proved magnesium oxide for neoprene.

on scorch protection

If the use of MAGLITE raises questions in your mind you can count on Merck Marine Magnesium Division for the answers. We have been working with magnesias for rubber compounding ever since 1943. That puts nearly two decades of experience on our side. And with the Merck Rubber Laboratory we have the necessary technical facilities as well. Located in South San Francisco, the Rubber Laboratory is devoted exclusively to research and development of magnesias for the rubber industry.

As far as we know it is the only one of its kind in existence.

• Merck & Co., INC. Rahway, New Jersey

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Factice®

Vulcanized Vegetable Oils

- ☐ Increase in speed of extrusion
- ☐ Minimize variation in die swell
- ☐ Better mold flow
- ☐ Reduce sticking to back roll
- ☐ Obtain higher loadings of compounds
- ☐ Absorb liquid plasticizers
- ☐ Inhibit "sweating out" of liquid plasticizers
- ☐ Reduce bloom
- ☐ Improve sunlight aging and ozone resistance

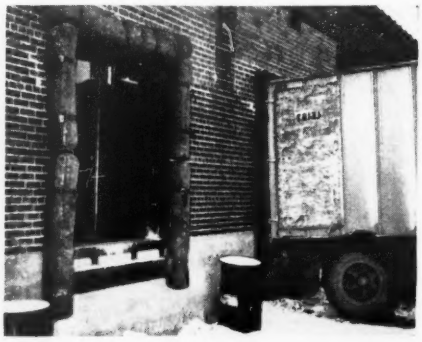
Laboratory-tested Factice, a vulcanized vegetable oil is available in three main grades: "WHITE", "BROWN", and "AMBEREX". The type of Factice should be chosen for a specific job as a certain polymer is selected for meeting definite specifications in the finished item.

Our well staffed laboratory will endeavor to answer your questions, as well as run laboratory samples on your suggested formulations. All formulas will be held in strict confidence.

The STAMFORD RUBBER SUPPLY CO.
Stamford, Conn.

new products

(*Continued from page 30*)



These loading platform bolsters, manufactured under the name, Door Gaskets, serve as air seals and bumpers

for Cooper. The neoprene-coated nylon covering is manufactured by Vulcan Rubber Products Division of Reeves Brothers, Inc., New York, N. Y., under the name Coverlight-N.

The bolsters act as an air seal between the back of a truck and the warehouse loading door, keeping out cold, wind, rain, and dust, and also act as bumpers to protect truck and building from damage.

Commuter—New Winter Tire

Seiberling Rubber Co., Akron, O., has developed a new winter tire which it says offers greatly improved snow traction over its earlier models. Extensive tests held in 20-25° weather in both snow and ice conditions showed improvement in snow and ice traction and an increase in stopping ability, Seiberling reported.

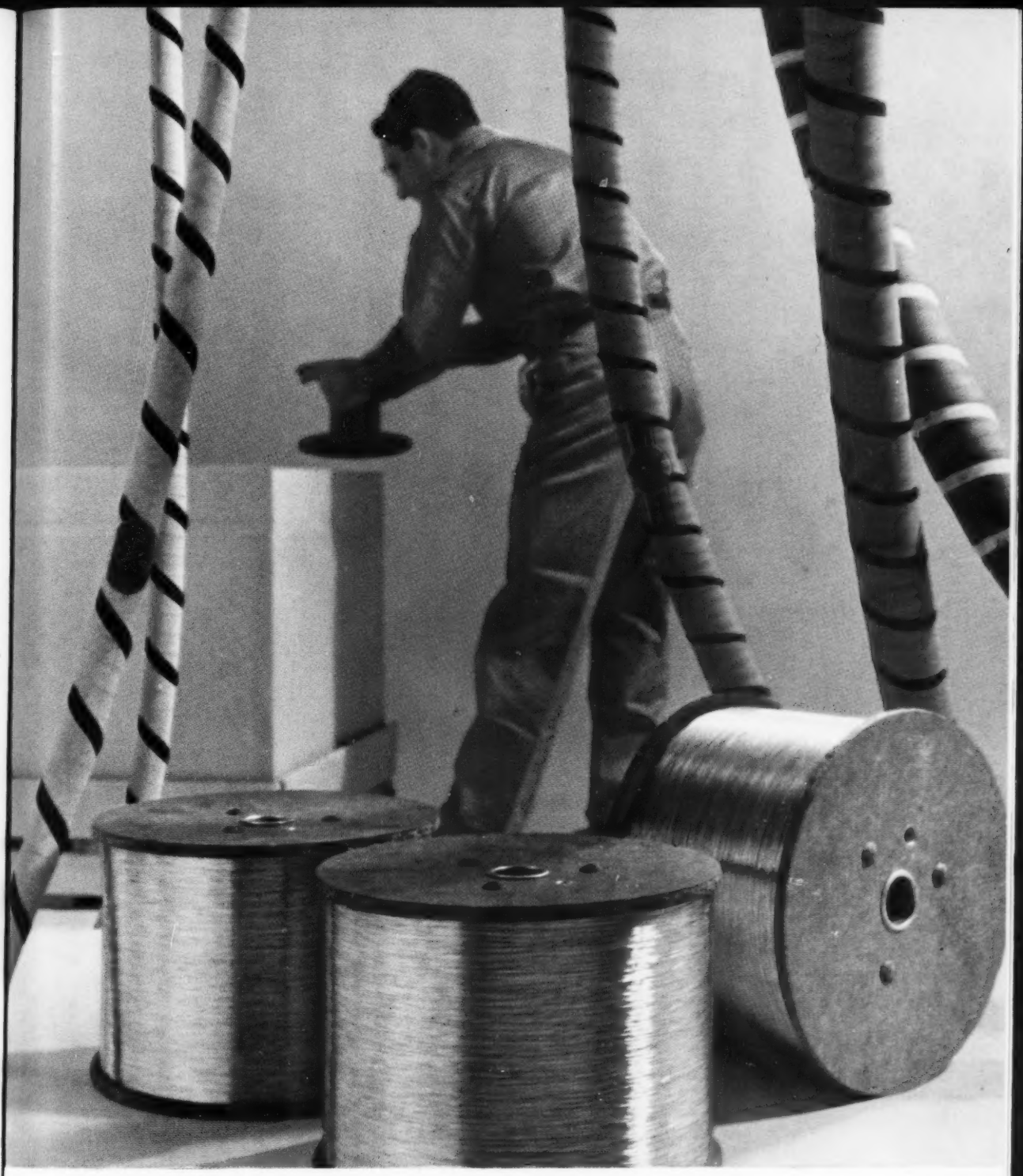
The principal change in the new model is that it now has tread slots in the lug area to afford a greater grip on snow and ice, the manufacturer claims. The new commuter tire will be produced in all standard sizes.

■

XS-4030—New Silicone Product

A new ready-to-use silicone solution for use as a release agent and lubricant has been introduced by the silicone products department, General Electric Co., Waterford, N. Y. The new material, XS-4030, is suggested by the manufacturer as a release agent in molding mechanical rubber goods, and as a lubricant for surfaces of calender and embossing rolls.

XS-4030 contains a 5% solution of silicone in a petroleum solvent, and has a viscosity of approximately 5 centistokes, the manufacturer says. The material may be applied by brushing, swabbing, or spraying on molds or other surfaces.



Roebling Hose Reinforcing Wire...

The best things come in no-charge packages

When you buy Roebling Hose Reinforcing Wire it is delivered to you on no-charge spools that mean savings to you.

This modern method of packaging does away completely with deposits and the bookkeeping involved; it contributes, too, to lower freight costs and saves storage space. Thus, you avail yourself of a precision-made and quality controlled product, without any handling, shipping and inventory inconveniences.

Roebling Hose Reinforcing Wire, used for braiding reinforcement, is produced in a complete range of sizes. Write Roebling's, Wire and Cold Rolled Steel Products Division, Trenton 2, New Jersey, for details.

Roebling . . . Your Product is better for it

ROEBLING

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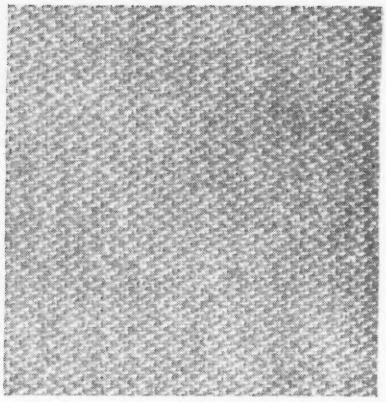
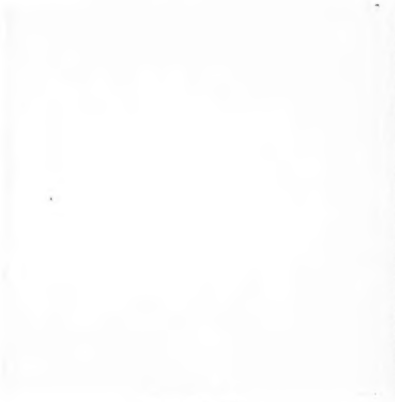
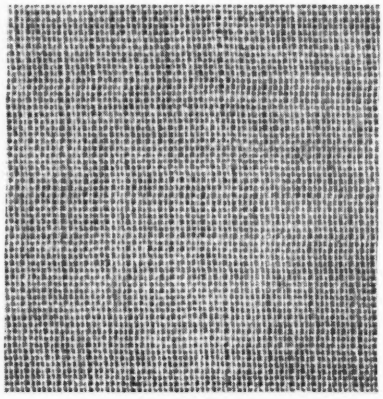


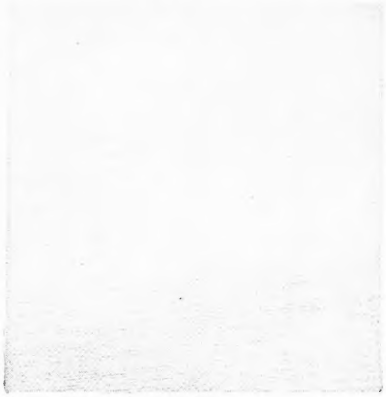
Cotton Broken Twill



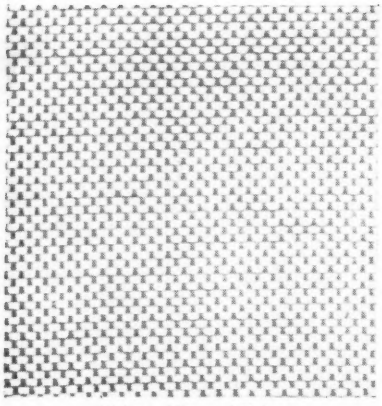
Spun Dynel



Cotton Chafer



Spun Rayon



Welkote Filament Nylon

Knit Kote

Lantuck

Shown here is just a tiny sample of the many quality base fabrics offered by Wellington Sears for both plastic and rubber coating. The entire selection is more complete and up-to-the-minute than can be found anywhere else in the textile industry.

There are wovens, non-wovens and knits in cotton and synthetics for every coating application. All are continuously proving themselves—in a variety of uses ranging from air-supported domes and collapsible fuel tanks to luggage, upholstery and garments.

Leading companies at home and abroad rely on the century-long experience of Wellington Sears in supplying fabrics to industry. When you have a problem, call on us. And, in the meantime, write for our free illustrated booklet "Fabrics Plus," Dept. H-9.

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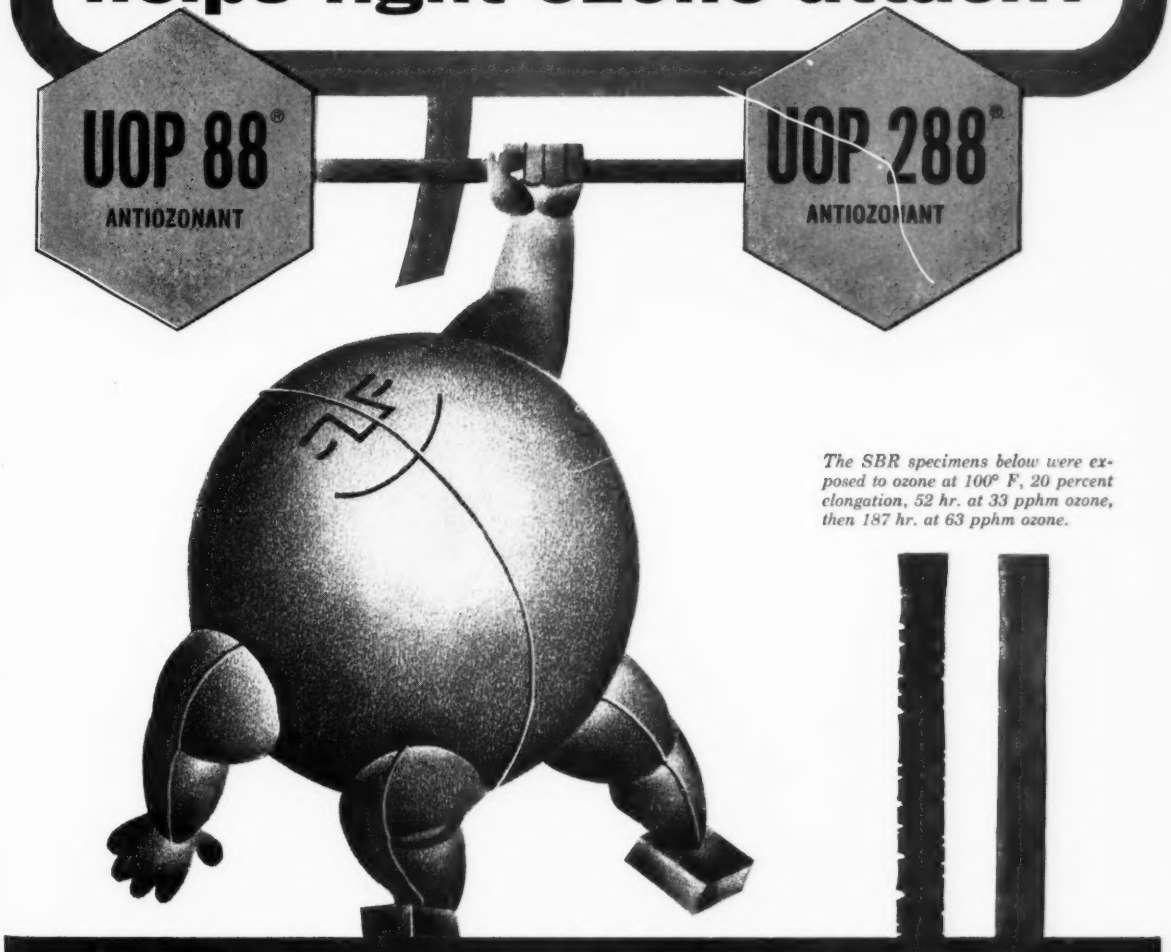
what type of CARBON BLACK helps fight ozone attack?



The SBR specimens below were exposed to ozone at 100° F, 20 percent elongation, 52 hr. at 33 pphm ozone, then 187 hr. at 63 pphm ozone.

the kind you choose can be a help or a hindrance . . .

Are you aware of the extent to which some carbon blacks adversely affect the protection afforded rubber products by antiozonants?

Some inactivate much of the antiozonant added for ozone protection. Others are more compatible with the antiozonant.

The two rubber test strips shown at right are clear evidence that carbon black plays an extremely important part in obtaining maximum service life of rubber compounded with antiozonants.

In formulating rubber compounds which must have high resistance to ozone, look to Universal for assistance. Special facilities and technical personnel are available to serve you. Write or telephone our Products Department.

(Left) Carbon black—EPC (easy processing channel), Curing system—2 phr sulfur, 2 phr benzothiazyl disulfide, Hours to first crack—31 to 47.

(Right) Carbon black—HAF (high abrasion furnace), Curing system—2 phr sulfur, 2 phr benzothiazyl disulfide, No cracks in 239 hr.

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UNIVERSAL OIL PRODUCTS COMPANY

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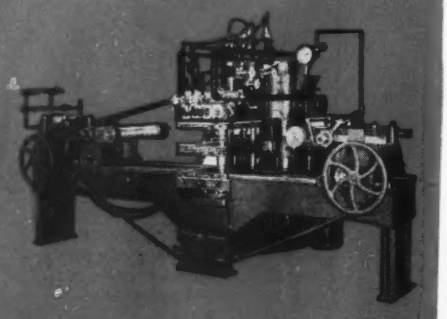
Des Plaines, Illinois, U. S. A.

R. D. WOOD HYDRAULIC



For V-Belt Manufacturing—Machine No. 8358. An open side belt press for curing flat and V-type transmission belts. Complete with stretcher equipment. Capacity, 47 tons; stroke of main ram, 12"; number and height of press openings, 2 @ 6"; size of heating platens, 24" x 24"; height of press, 6' 8"; floor space required, 5' 8½" x 4' 9½"; weight on foundation, 12,000 lbs.

engineered to give you 3 outstanding advantages

Top Production Precise, practical design, highest manufacturing standards, and top quality materials are the reasons Wood Presses guarantee you smooth, dependable operation that speeds production and shrinks costs.

Minimum Maintenance For years, Wood Presses have been proving their value in curing, vulcanizing, laminating and molding operations—and you hardly ever see one shut down for repairs. Simplicity of design and easy accessibility keep maintenance to a minimum.

Years of Reliable Performance Wood Presses are built to last for years. With sound planning now, your press installation can be designed to anticipate future expansion. Later, conversion can be made with minimum time loss and expenditure for new equipment.

Learn more about Wood Presses and how they can increase your production. Some of the many types and styles for the rubber and belting industry are listed here. For more complete information, contact our nearest representative, or write directly to our main office in Philadelphia.

R. D. WOOD COMPANY

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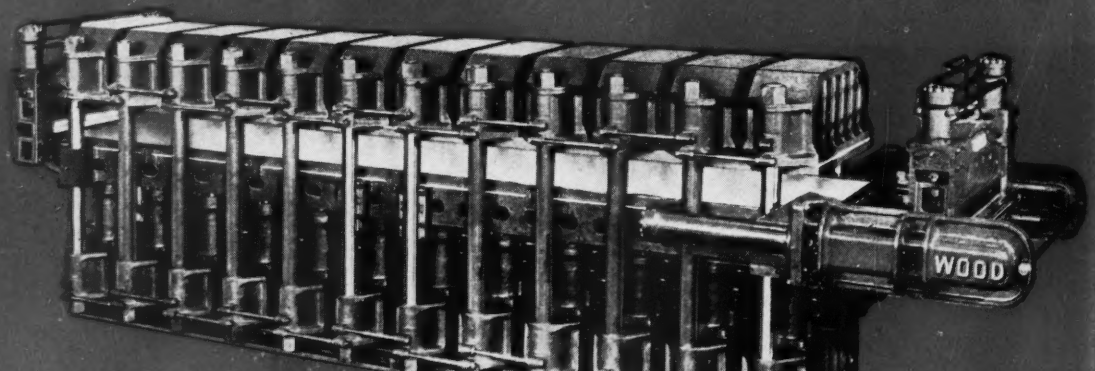

For Belt Vulcanizing—Machine No. 8474. Multiple cylinder, single opening, hydraulic belt press for vulcanizing rubber belting. Capacity, 3,180 tons; stroke of rams, 12"; number and height of press openings, 1 @ 12"; size of heating platens, 63¼" x 30' 0"; overall height, 10' 2½"; height above floor line, 7' 0"; floor space required, 9' 0" x 39' 0"; weight on foundation, 350,000 lbs.

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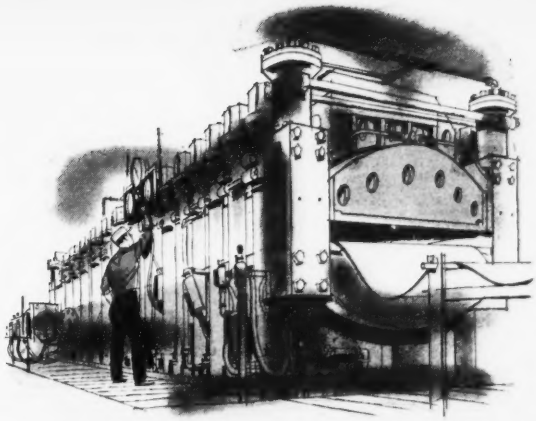
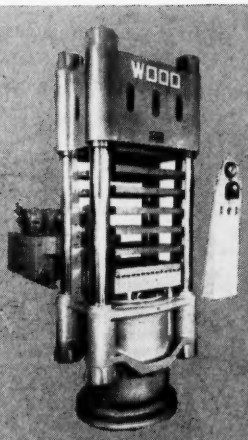
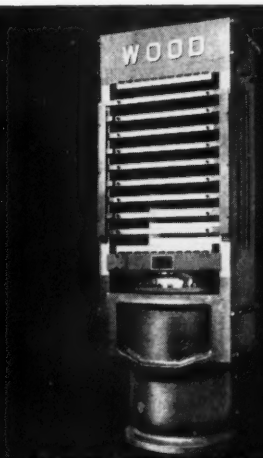
PRESSES...

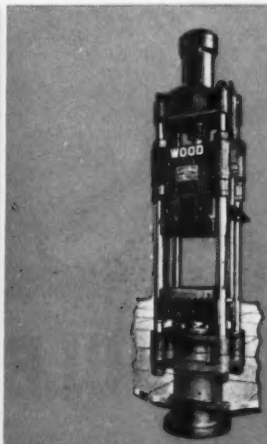




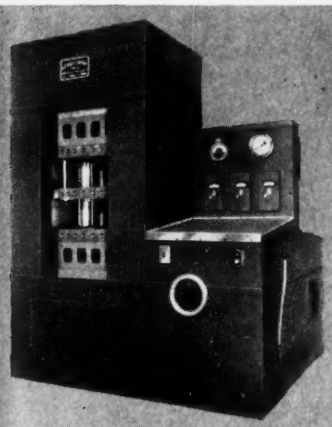
For Curing Operations—Machine No. 9420. Self-contained, multiple opening, four-column press. Capacity, 1,200 tons; stroke of ram, 36"; size of heating platens, 42" x 42"; number and height of press openings, 6 @ 6"; approach and return speed, 50"/min.; pressing speed, 2.5"/min.; height of press, 15' 6"; floor space, 6' x 11' 3"; weight on foundation, 80,000 lbs.



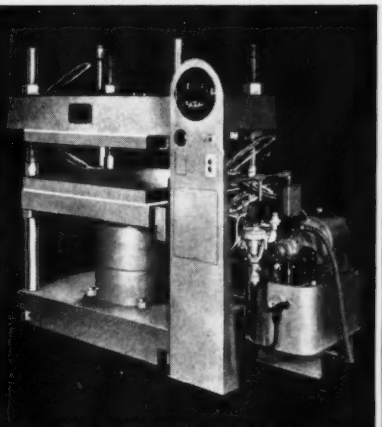
For Curing Operations—Machine No. 9448. An accumulator operated, multiple opening, slab-side press. Capacity, 1,100 tons; stroke of ram, 40"; size of heating platens, 42" x 42"; number and height of press openings, 10 @ 4"; height of press, 13' 10"; floor space required, 5' 1" x 4' 4"; weight on foundation, 75,000 lbs.



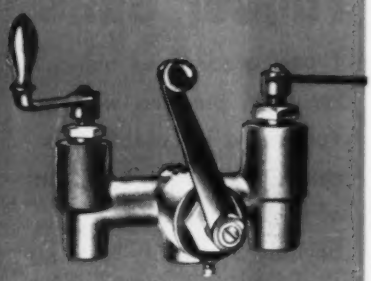
For Molding Operations—Machine No. 9275. A four-column transfer type hydraulic molding press. Capacity, 190 tons; stroke of clamping ram, 2' 3"; stroke of transfer cylinder ram, 16"; die space, and size of hot plates, 24" x 24"; daylight between hot plates, 22⅝"; height of press, 13' 6¾"; floor space, 3' 0" x 2' 6"; weight on foundation, 14,500 lbs.



For Molding Operations—Machine No. 8540. Self-contained press, with steam or electrically heated platens. Capacity, 570 tons; stroke of ram, 17"; size of heating platens, 22" x 22"; press openings, 2 @ 8½"; approach speed and return, 26.2"/min.; pressing speed, 2.3"/min.; height of press, 9' 10"; floor space, 5' 9¼" x 6' 5¼"; weight, 26,000 lbs.



For Molding Operations—Machine No. 9318. Self-contained, single-opening steam platen press. Capacity, 200 tons; stroke of ram, 10"; height of openings (adjustable), min. 5", max. 20"; heating platens, 48" x 48"; closing and pressing speed, 4"/min.; return speed, 20"/min.; height, 6' 7½"; floor space, 4' 0" x 8' 6"; weight on foundation, 26,600 lbs.



Complete Line of Hydraulic Valves—Every hydraulic valve you need for a new system or updating an existing installation. Choose from a complete line of stop valves, check valves, operating valves, safety relief valves, shock absorbers, accumulator control valves and a large variety of special valves. Illustrated is two-pressure, three-screw stem valve.

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SINCE
CARTER BELL PRODUCTS
1903
SPRINGFIELD, NEW JERSEY

Vulcanized
VEGETABLE OILS

rubber substitutes

Types, grades and blends
for every purpose, wherever
Vulcanized Vegetable Oils
can be used in production
of Rubber Goods —
be they Synthetic, Natural,
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A long established and proven product.

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technical books

BOOK REVIEWS

"Encyclopédie Technologique de l'Industrie du Caoutchouc." Volume II. Edited by G. Génin and B. Morisson; published by Dunod, 29 Rue Bonaparte, Paris 6, France, 1960. Cloth, 6½ by 9¾ inches, 784 pages, 116 figures. Price, 94 new francs.

Another installment, Volume II, of the five-volume French technological encyclopedia for the rubber industry recently was published. Divided into three parts, it covers (1) the properties of natural and synthetic rubbers; (2) compounding, and (3) the main accessory materials. Part 1 is edited by J. Le Bras, scientific inspector general of the Institut Français du Caoutchouc, who also contributes the first chapter in which the composition and chemical properties of the rubber hydrocarbon are discussed. The next eight chapters of Part 1 successively deal with vulcanization, derivatives, oxidation and aging of rubbers, physical and mechanical properties and reclaiming of natural and synthetic rubbers; properties and processing of neoprene, butyl rubber, and thioplastics. The data on the latter three rubbers complete the information given in Volume I on the manufacture of these products. Circumstances prevented similar treatment of the other synthetic rubbers.

R. Thiollet edits Part 2, which deals with compounding, starting from the working out of formulas, going on to a consideration of ingredients, plasticizers, peptizers, extenders, protective agents, plastics, and modified rubbers, and concluding with details on the actual compounding process.

Part 3 describes auxiliary materials used by the industry, as textiles, asbestos, fiberglass, varnishes, and solvents.

With the publication of Volume II, the encyclopedia is nearing completion. Volumes III and IV appeared in 1956; Volume I in 1958. There now remains only Volume V, which is to cover equipment and testing and will also provide a general index.

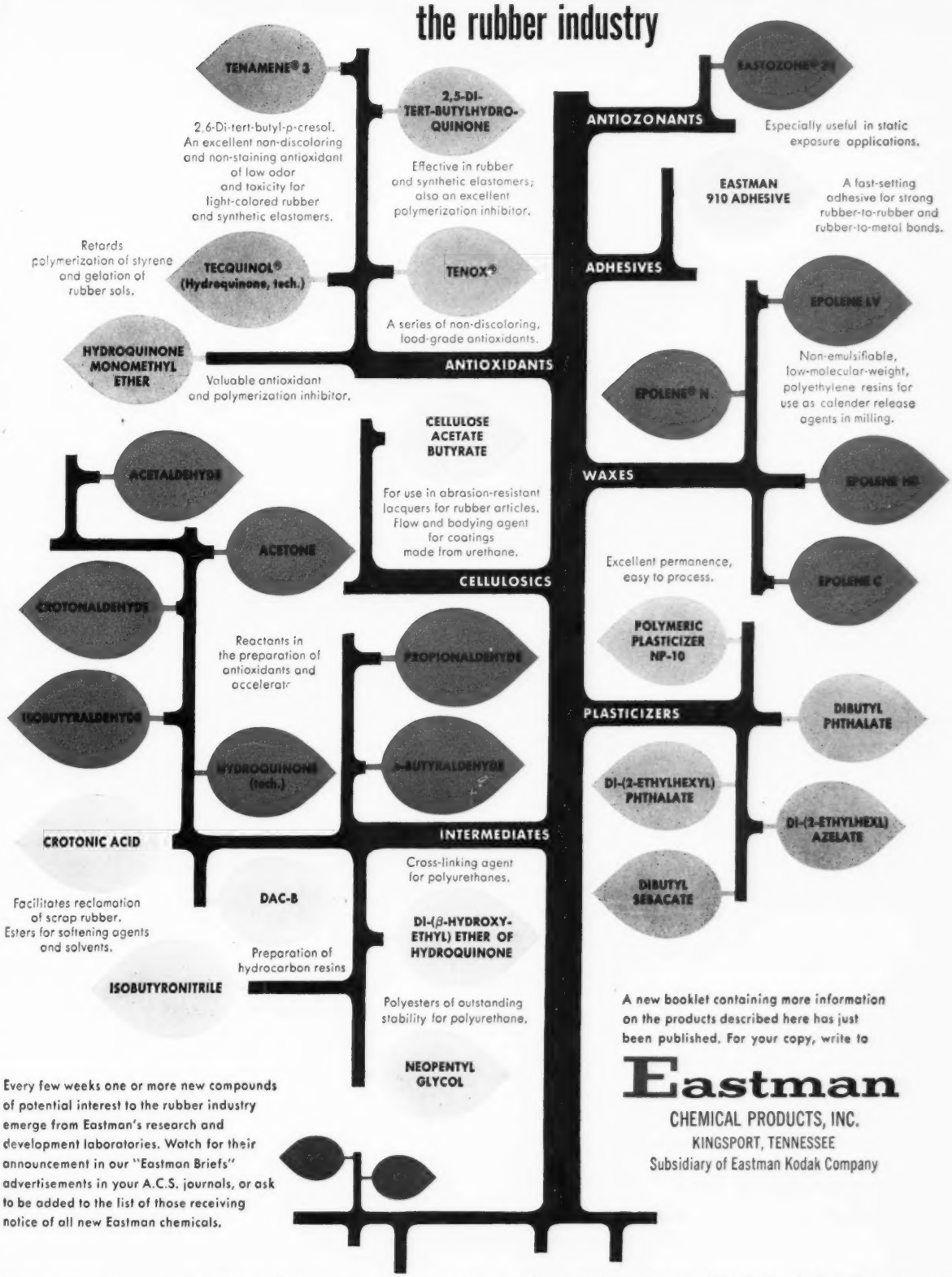
"Annual Report on the Progress of Rubber Technology." Vol. XXIII, 1959. Edited by T. J. Drakeley. W. Heffer & Sons, Ltd., Cambridge, England, 1960. Cloth, 7¼ by 9⅞ inches. 156 pages. Price £1-5s.

This annual report, published for the Institution of the Rubber Industry, 4 Kensington Palace Gardens, London, W.8, contains highlights of last year's developments in various phases of the rubber industry. The book contains 25 chapters by experts in the field on rubber production and consumption,

(Continued on page 44)

From Eastman...

A family of fine products to serve the rubber industry



Every few weeks one or more new compounds of potential interest to the rubber industry emerge from Eastman's research and development laboratories. Watch for their announcement in our "Eastman Briefs" advertisements in your A.C.S. journals, or ask to be added to the list of those receiving notice of all new Eastman chemicals.

A new booklet containing more information on the products described here has just been published. For your copy, write to

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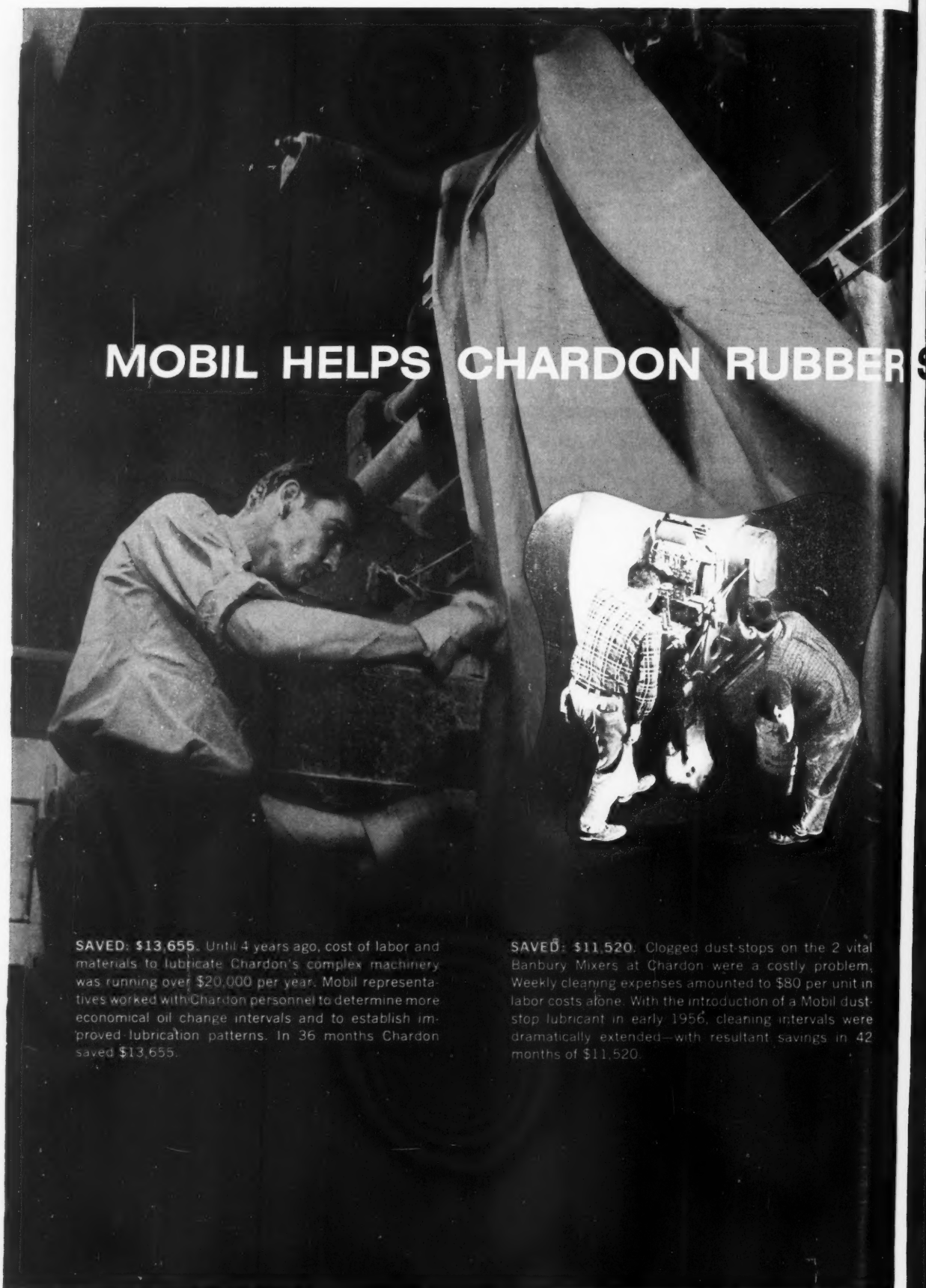
SALES OFFICES: Eastman Chemical Products, Inc., Kingsport, Tenn.; Atlanta; Chicago; Cincinnati; Cleveland; Detroit; Framingham, Mass.; Greensboro, N. C.; Houston; New York; Philadelphia; St. Louis. **West Coast: Wilson Meyer Co.,** San Francisco; Los Angeles; Portland; Salt Lake City; Seattle.



SAVED: $13,655. Until 4 years ago, cost of labor and materials to lubricate Chardon's complex machinery was running over $20,000 per year. Mobil representatives worked with Chardon personnel to determine more economical oil change intervals and to establish improved lubrication patterns. In 36 months Chardon saved $13,655.

SAVED: $11,520. Clogged dust-stops on the 2 vital Banbury Mixers at Chardon were a costly problem. Weekly cleaning expenses amounted to $80 per unit in labor costs alone. With the introduction of a Mobil dust-stop lubricant in early 1956, cleaning intervals were dramatically extended—with resultant savings in 42 months of $11,520.

SI

Oil life extended, lubrication costs slashed, maintenance techniques improved, equipment downtime reduced—average annual savings over four-year period: $6,928.

The Chardon Rubber Company produces a wide variety of specialty items for industry. These items include thousands of precision-molded and -extruded rubber and plastic pieces of various shapes.

Quality control and accuracy are of prime importance at Chardon. And to maintain high level production and equipment performance, Chardon relies on Mobil lubricants and Mobil technical assistance. By suggesting oil re-use, by extending lubricant life, by recommending correct products and improved application techniques, Mobil has helped Chardon *save twice as much in maintenance costs as they have spent on Mobil Products.*

Interested in how Mobil may benefit you? Call your Mobil Representative. Or write: Mobil Oil Company, 150 East 42nd Street, New York 17, N. Y.

SHAPE $27,713 SAVINGS!

SAVED: $1,600. With excessive carbon build-up causing faulty valve seating and an explosion hazard in three air compressors at Chardon, these compressors had to be opened up for valve cleaning or replacement an average of 10 times a year collectively. Mobil recommended correct cylinder lubricant and proper feed rates. Result: compressors have run over 4 years without overhaul.

SAVED: $938. Chardon Rubber encountered these problems in 42 molding presses: damaged packings, gasket failures, leaking valves and rusted rams and cylinder walls. By changing the hydraulic fluid formulation, Mobil has reduced these problems materially—saved Chardon $938 in 18 months.

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technical books

(Continued from page 40)

production of raw rubber and latex, chemistry and physics of raw and vulcanized rubbers, synthetic rubber research and production, testing and testing equipment, compounding ingredients, fibers and fabrics, tires, belting, hose and tubing, cables and electrical insulation, footwear, mechanical rubber goods, sports accessories and toys, surgical goods, textile-rubber composites, cellular rubber, hard rubber, flooring, manufacturing developments, new manufacturing equipment, and roads.

Intended to be a selective rather than a comprehensive report, this publication is a valuable thumbnail survey with complete listing of source materials for those wishing details on particular developments.

NEW PUBLICATIONS

"A Study of ISAF Carbon Black and Oil Levels in Oil-Extended Rubber." Bulletin No. 33. Phillips Chemical Co., Akron, O. 9 pages. These data sheets present an evaluation of effects of physical properties in a typical tread compound at various levels of loading of carbon black and oil. Included are laboratory figures and isopleth graphs.

"New Improved Delac-S." Bulletin 234. Naugatuck Chemical Division, United States Rubber Co., Naugatuck, Conn. 4 pages. Comparison is made in photographs and tables of Delac-S (brand name of N-cyclohexyl-2-benzothiazole sulfenamide) with two other competitive cyclohexyl sulfenamides. The manufacturer says that the new form of Delac-S, a delayed-action accelarator, obtains improved dispersion, decreases incorporation time, minimizes fall through, back roll, and Banbury rotor caking.

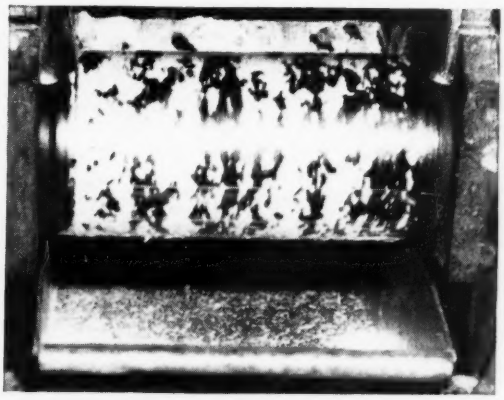
"Silicones for the Automotive Industries." Reference 1-118. Dow Corning Corp., Midland, Mich. 8 pages. This booklet describes properties and applications of Dow Corning silicone rubbers, resins, fluids, lubricants, laminates, paints, adhesives, defoamers, and additives.

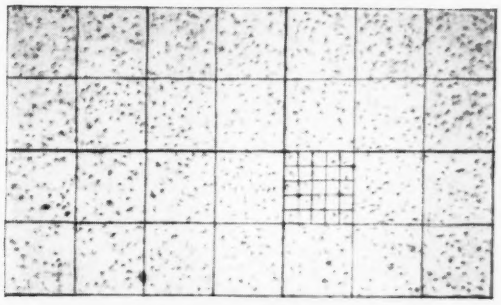
"Twenty-Second Annual Report of the British Rubber Producers' Research Association." May, 1960. Natural Rubber Producers' Research Association (formerly the British Rubber Producers' Research Association), 19 Fenchurch St., London, E.C.3. England. 53 pages. This year's report contains summaries of research on new techniques of rubber tree growth promotion, cis-trans isomerization of natural rubber and gutta percha, new methods of vulcanization, and studies in the physics and chemistry of natural rubber. Included is a two-page listing of publications issued in 1959.

(Continued on page 48)

Naugatuck DELAC-S

FROM A WORLD LEADER IN RUBBER CHEMICALS





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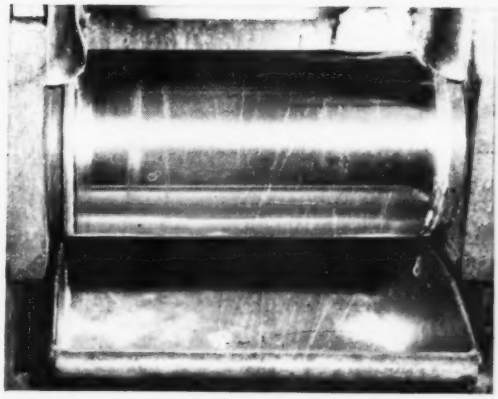
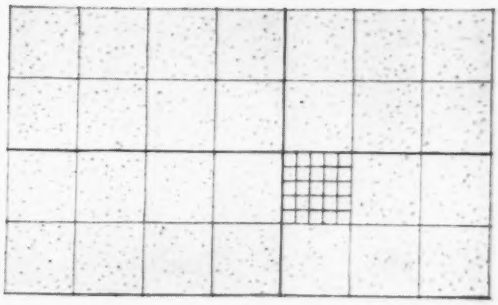
Bad caking and fall through, uneven dispersion.
Incorporation time, 1'45".





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obtain improved dispersion
decrease incorporation time
minimize fall through
eliminate back roll and Banbury rotor caking

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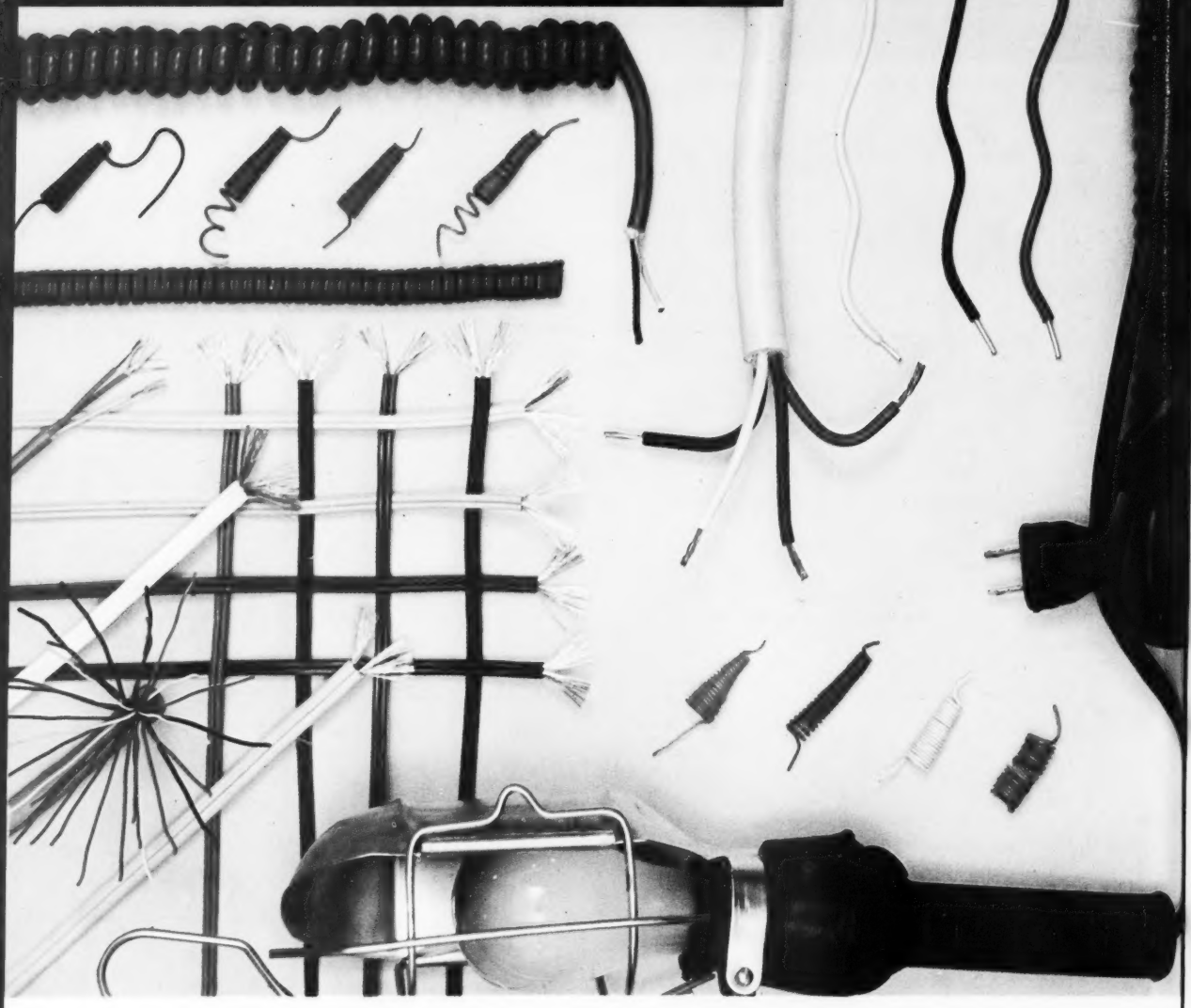

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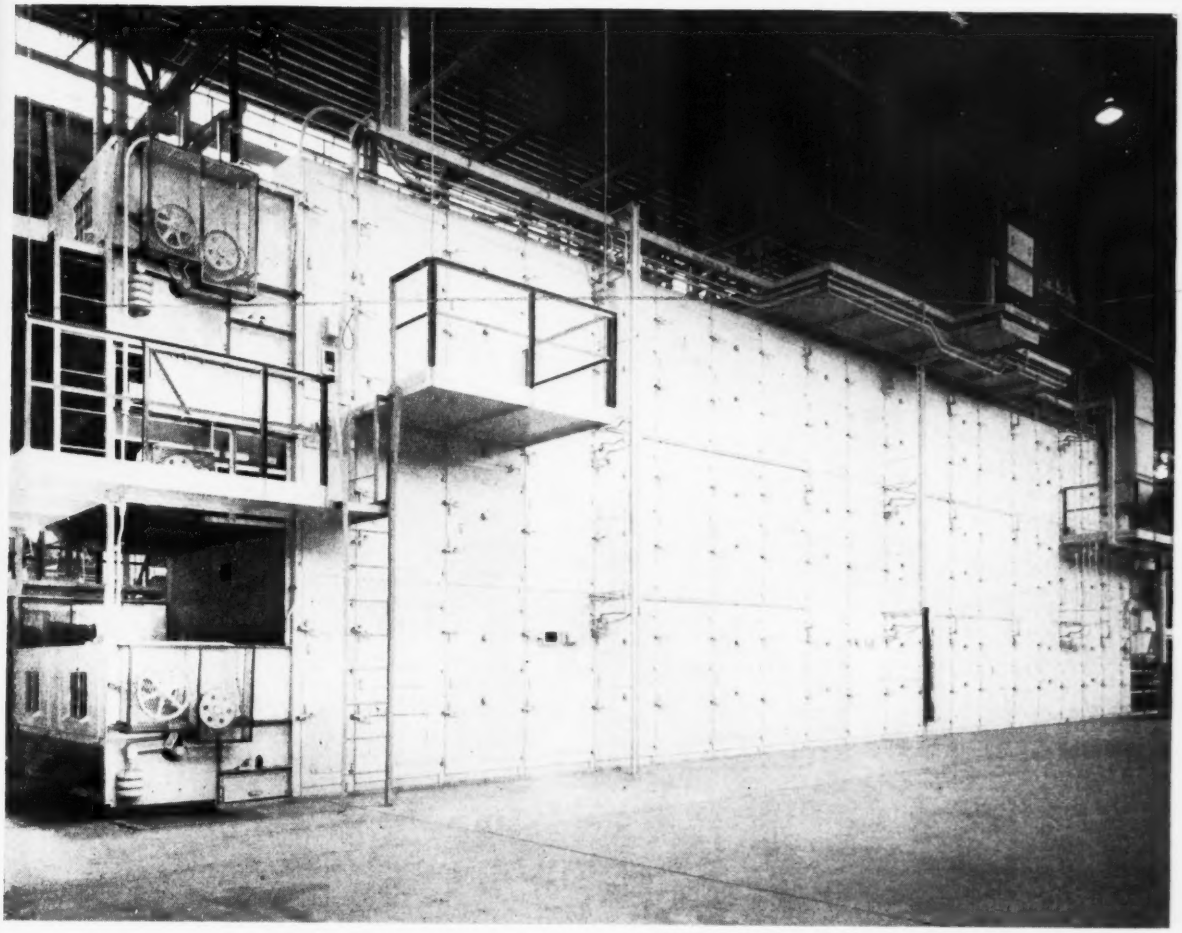

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POLYMER CORPORATION LIMITED, of Canada, world leaders in development of new applications and new compounding techniques for synthetic rubbers, selected SARGENT to design and build this high volume dryer for their modern new plant at Sarnia. It is believed to be the world's largest gas-fired synthetic rubber dryer . . . and was erected in a record-breaking four weeks.

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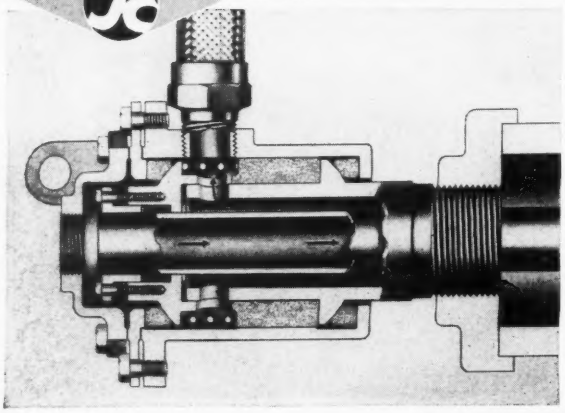

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technical books

(*Continued from page 44*)

"Aromex SAF Super Abrasion Furnace Black." J. M. Huber Corp., New York, N. Y. 8 pages. This publication compares physical properties of Aromex SAF with competitive SAF blacks in one SBR and two natural rubber test recipes, one of which is the ASTM standard test recipe.

"RTV Liquid Silicone Rubber." Technical Data Book S-3. Silicone products department, General Electric Co., Waterford, N. Y. 12 pages. This brochure covers properties, handling, and applications of the GE room-temperature vulcanizing silicone rubber compounds.

"Vistanex Polyisobutylene, Properties and Applications." Butyl Division, Enjay Chemical Co., a division of Humble Oil & Refining Co., New York, N. Y. 24 pages. This booklet, which replaces the 1948 edition, now out of print, covers processing, properties, and applications of Vistanex.

"Ozone Resistance of Polysulfide Crude Stocks." Bulletin CS-2. Thiokol Chemical Corp., Trenton, N. J. 8 pages. This booklet describes tests to determine ozone resistance of polysulfide rubbers and effectiveness of antiozonants and antioxidants for improving ozone resistance.

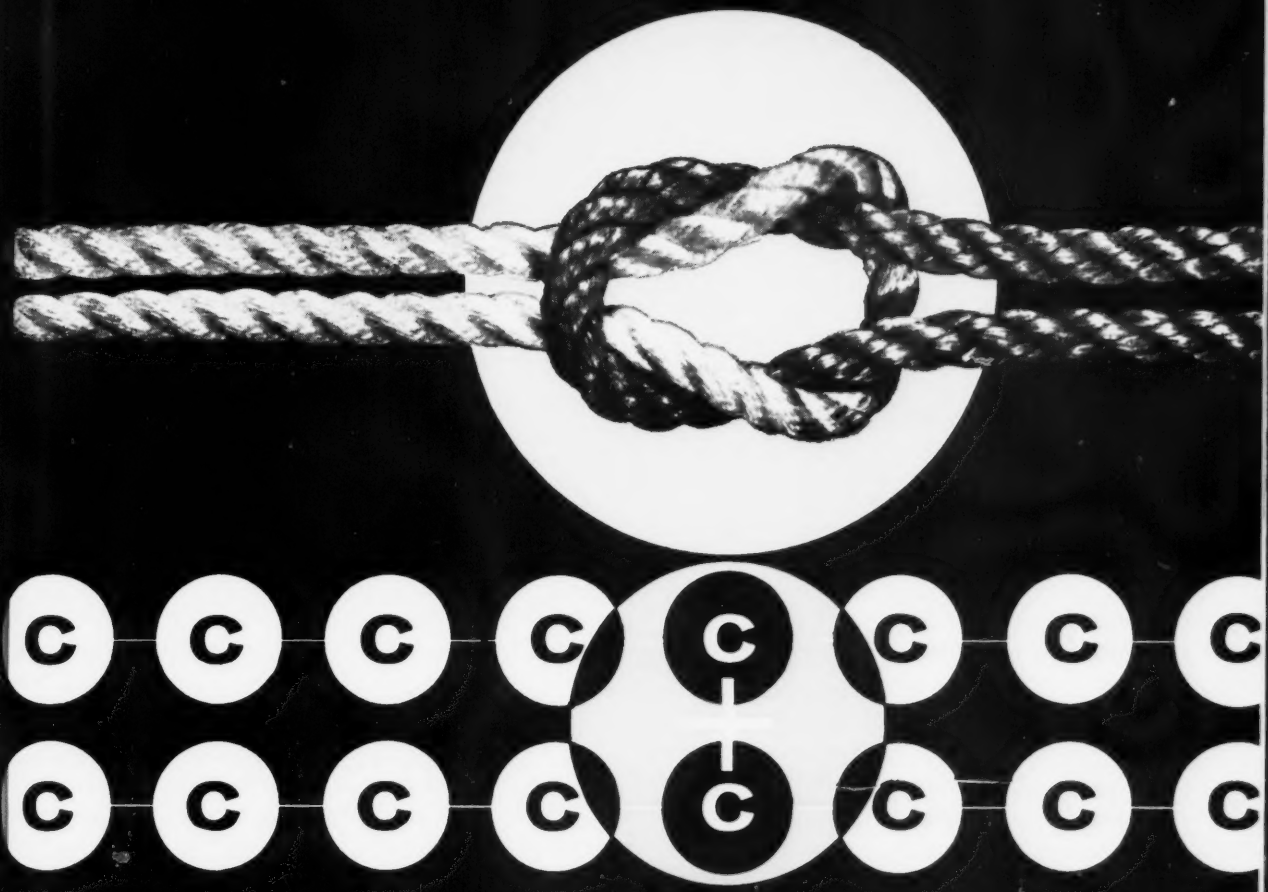
"Armids." Armour Industrial Chemical Co. 24 pages. This booklet covers composition and constants, chemical properties, and applications of Armid HT, Armid O, Armid C and Armowax, high molecular weight aliphatic amides used in the manufacture of molded rubber products, protective coatings, water repellents, inks, and plastics.

"Mineral Extenders for Urethane Foams." Bulletin TI-260. Minerals & Chemicals Corp. of America, Menlo Park, N. J. 8 pages. This bulletin describes use of aluminum silicate extenders in the ingredients of prepolymer flexible foams, "one-shot" flexible foams, and quasi-polymer and "one-shot" rigid foams before foaming. Included are formulas, comparisons of properties, and cost data.

"Hall Laboratories, Industrial Water Consultants." Hall Laboratories, division of Hagan Chemicals & Controls, Inc., Pittsburgh, Pa. 24 pages. This brochure discusses, in question and answer form, a number of industrial water problems and the part a water consultant can play in solving them. Included are a history of Hall, case histories, and a bibliography of technical papers on water management written by Hall engineers.

"Lord Product Guide." Bulletin No. 905. Lord Mfg. Co., Erie, Pa. 8 pages. This bulletin covers products for vibration, shock, and noise control.

(*Continued on page 50*)



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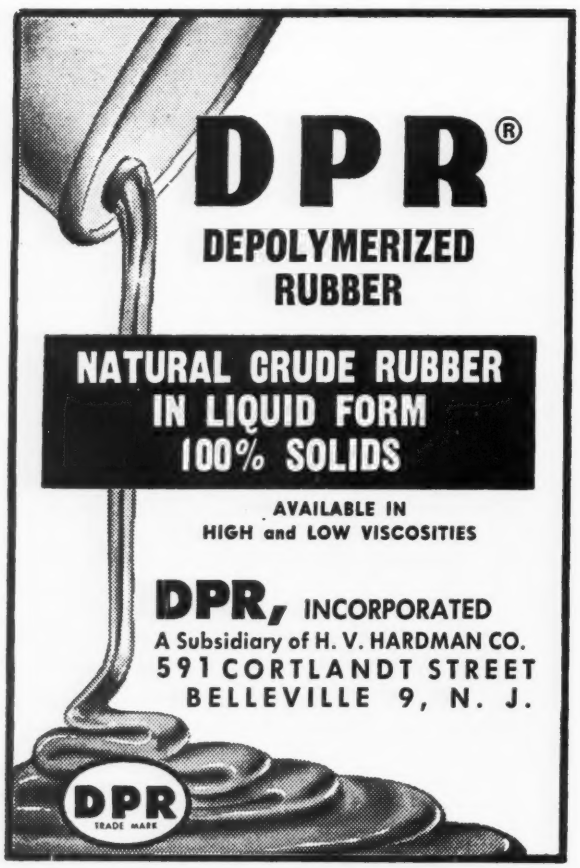

technical books

(*Continued from page 48*)

Publications of Texas-U. S. Chemical Co., New York, N. Y.:

"SBR Floor Tile, Cost and Quality Improvement." D. D. Dunnom. Technical Data Bulletin #2. 10 pages. This bulletin discusses selection of fillers and pigments with particular SBR rubbers to cut cost and improve quality of floor tiles. Five pages of tables show variations in properties with different SBR rubbers and with different loadings of fillers.

"Mechanical Goods Compounds: Effects of Polymer Selection and Compound loading on Physical Properties." D. D. Dunnom. Technical Data Bulletin #3. 8 pages. These sheets cover the results of compounding recipe variations using a Synpol SBR-carbon black masterbatch at various clay loadings, and a variety of clear Synpol extended and non-extended polymers in two recipes. Five pages of tables are included.

Publications of chemical division, Goodyear Tire & Rubber Co., Akron, O.:

"Plioflex Rubber—Types and Properties." Tech Book Facts PF-17. 4 pages. This folder describes properties and applications of 11 Plioflex butadiene-styrene copolymers, including Plioflex types 1006, 1500C, 1502, 1507, 1508, 1510, 1712C, 1713, 1714C, 1773, and 1778. Hot, cold, and cold oil-masterbatch types, both staining and non-staining, are listed.

"Rubber Flooring." Tech Book Facts PF-33. 12 pages. This booklet presents 20 compound recommendations for conventional rubber flooring and six for bus flooring. The base polymer used in the formulations is Plioflex 1006. Included are manufacturing descriptions and a color chart for the rubber flooring compounds.

"Plioflex 1510." Tech Book Facts PF-34. 2 pages. This data sheet deals with physical properties of Plioflex 1510, a low Mooney, cold SBR polymer stabilized with a non-staining, non-discoloring antioxidant, and suggests applications.

"Original-Equipment-Type Automotive Mats." Tech Book Facts PF-35. 2 pages. This data sheet describes compounding using Plioflex 1714C and 1713 to meet test requirements of Types 1, 2, 3, and 5 of SAE8OR automotive rubber mats, with physical properties of compounds.

"Retread Cementing." Bulletin #10. The Rubber Manufacturers Association, Inc., New York, N. Y. 2 pages.

"Benzoyl Peroxide." Safety Data Sheet SD-81. Manufacturing Chemists' Association, Washington, D. C. 30¢ each.

"Ucon Fluids and Lubricants." Union Carbide Chemicals Co., division of Union Carbide Corp., New York, N. Y. 52 pages.

"Fuller Feeders and Rotary Valves." Bulletin F-5A. Fuller Co., Catasauqua, Pa. 8 pages.

"The Facts about Flexible Tubing." Catalog 10-19. Flexible Tubing Corp., Guilford, Conn. 4 pages.

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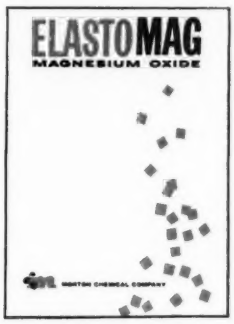

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Chemical Manufacturers

No. 9

HALLCO C-566 PLASTICIZER CUTS MIXING TIME OF NATURAL OR SYNTHETIC RUBBERS

When used in the processing of rubber, Hallco C-566 greatly reduces mixing time by speeding up dispersion of carbon black or other fillers. It also gives excellent scorch protection, often more than doubling scorch resistance time. Hallco C-566 has no measurable effect on the hardness of finished products. This economical plasticizer minimizes shrinkage in calendered stock and imparts superior smoothness to extrusions. It gives outstanding results when used for camelback, molded goods, channel stocks, cement stocks and all extruded items. Charts below show its unusual properties in our tests. Hallco C-566 is manufactured by The C. P. Hall Company and is available in drums or tank cars.

Stock Containing C-566:

	Without C-566 A	With C-566 B
Smoked Sheet	100	
Zinc Oxide	4	
Stearic Acid	0.5	
EPC Black	25	
FEF BLACK	25	
Ultex	0.75	
Sulphur	2.75	
C-566	....	7.5
	158	165.5

Mooney Scorch SR @ 250° F.

Minutes to 3-point rise	5.25	8.0
Minutes to 5-point rise	5.75	8.5
Minutes to 10-point rise	6.25	11.0

Samples and data on Hallco C-566 are available on request. Order yours today!

Be Accurate: Call it PARA-FLUX® only if it came from The C. P. Hall Company

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... eleven assists for the ball player

Small sluggers in baseball's Little Leagues credit many "assists" to equipment made of rubber. On sandlot diamonds . . . and in big-league ball parks, too . . . chins and shins are protected with masks and guards containing rubber.

In the major leagues, every game is played with a new home plate made of rubber. Inner soles of rubber help protect players' feet; elasticized bandages steady aching joints; rubber adhesives keep scrapes clean. From the insulation on the electric wiring that gives the game its night life, to the core of the baseball itself, rubber products play an important part in our national pastime.

Shell Chemical supplies manufacturers with much of the synthetic rubber that goes into sporting equipment —and many more products besides.

Let Shell help you find the "assist" you need. You can depend on the big-league quality and uniformity and the wide variety of rubber polymers on Shell Chemical's roster.

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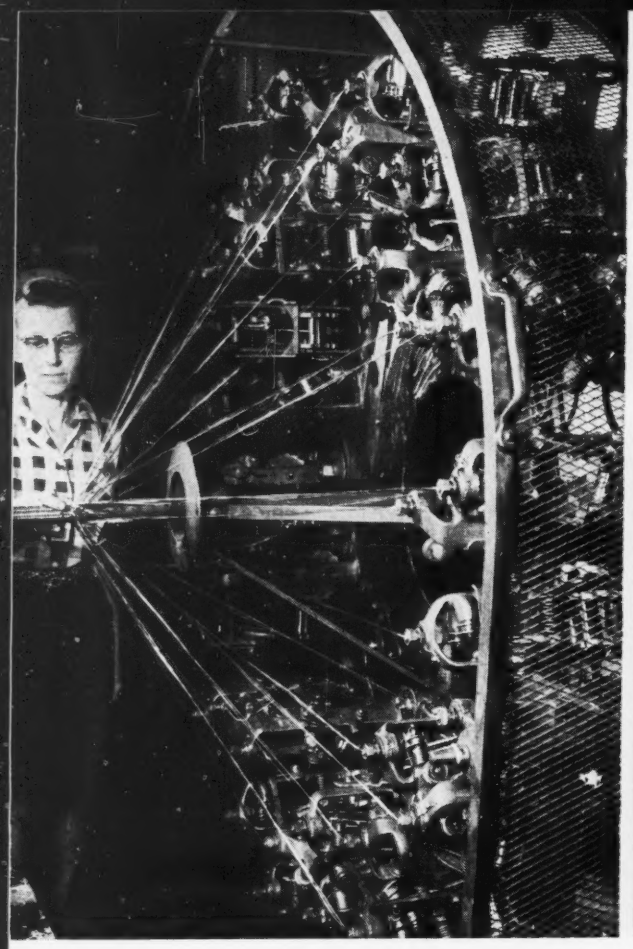

B. F. Goodrich Company braids multiple strands of steel wire into intricate sinews around rubber tube to help control and resist tremendous internal pressures required of flexible hydraulic hose. Wire such as supplied by Johnson has tensile strengths ranging from 240,000 to 400,000 psi.

Firestone Tire and Rubber Company uses only high tensile steel wire of exacting tolerances in building tire beads. Rapidly entering the bead machine in parallel —three to fifteen wires wide, depending on strength specified—the wires are coated with rubber. Clean bronze finish on Johnson wire assures proper rubber adhesion.

The best names in rubber use Johnson wire for strength and safety in tires and hose

The rubber industry has a sound reputation for producing quality products in advance of its needs by use of imaginative research—painstaking development of production methods—careful selection and testing of component materials.

Goodyear—Firestone—U.S. Rubber—B. F. Goodrich—Thermoid and others have established their names over the years by giving the general public and industry alike—strength, safety and durability in products such as long lasting pneumatic tires and tough pressure hose.

These two products owe their strength in part to the fine steel wires hidden inside them. For it is high-carbon steel bead wire which gives a pneumatic rubber tire—no matter what its size or job, the strength demanded by modern vehicles. Similar wire gives pressure hose its strong sinews which enable it to withstand working pressures as high as 10,000 psi—bursting strength may be three to four times as great.

Take the case of tire bead wire which Johnson supplies to every major tire manufacturer in the country. It is precision-drawn from special high-carbon rods to .037″ in diameter with a tolerance of only .002″—so fine that a 750-pound reel contains 39 miles of wire. Yet, a single strand exceeds 290 pounds of breaking strength equal to a tensile strength of 270,000 psi.

Also the wire must present a clean, unbroken surface and have a good and uniform bronze finish. This finish makes possible tight adhesion between the wire and the rubber surrounding it.

All these qualities contribute to the tire bead strength, help assure the safety of those who ride for work or pleasure on pneumatic tires.

Another special wire made by Johnson for the rubber industry helps rubber hose contain enormous pressures demanded by modern industrial applications. This reinforcing wire is drawn from selected high-

Thermoid Division, H. K. Porter Company, has cut wire rewind loss to ½ of 1% by use of Johnson Discard-a-Spool which eliminates overlaps and tangles, protects wire quality in shipment. The one-way disposable spool weighs only 28 ounces vs 200 ounces for standard spool—slashes tare weight 14 times.

United States Rubber Company wires tires for strength on this bead building machine. The strength comes from the steel wire bead in the edge of each tire. Johnson makes special high-carbon steel wire—.037″ in diameter with tolerance of only .002″ for U.S. and other major tire companies.

carbon steel in diameters ranging from .008″ to .020″ and has exceptional dimensional accuracy—tolerance is plus or minus .0005″.

Johnson hose reinforcement wire is supplied with a special liquor finish to provide maximum adhesion of steel to the rubber which fills the interstices between braids.

The wire is uniformly cast to make possible even spooling and has uniform tensile strength to prevent breaking under the working tension.

These excellent wire qualities, plus careful packaging and prompt delivery, have resulted in Johnson becoming a prime supplier to the rubber industry for hose reinforcement wire.

The outstanding performance of Johnson wire in the rubber industry is typical of the experience in other industries where Johnson supplies aircraft cord wire, armature binding wire, wire for brushes, metal stitching, preformed staple wire, bobby pin wire, rope wire, oil tempered and MB hard drawn spring wire, and music spring wire in a wide variety of sizes and finishes.

If you use specialty wires, call one of the offices listed to right and explore the advantages of Johnson quality which combines strength with economy.

The Goodyear Tire & Rubber Company finds that Johnson meets their exacting requirements for tire bead wire which has high tensile strength, twisting strength, elongation and special surface finish. Here parallel tire bead wires uncoil evenly into a bead building machine.

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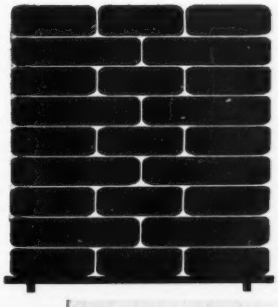

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STATEX M FEF Fast Extruding Furnace
STATEX 93 HMF High Modulus Furnace
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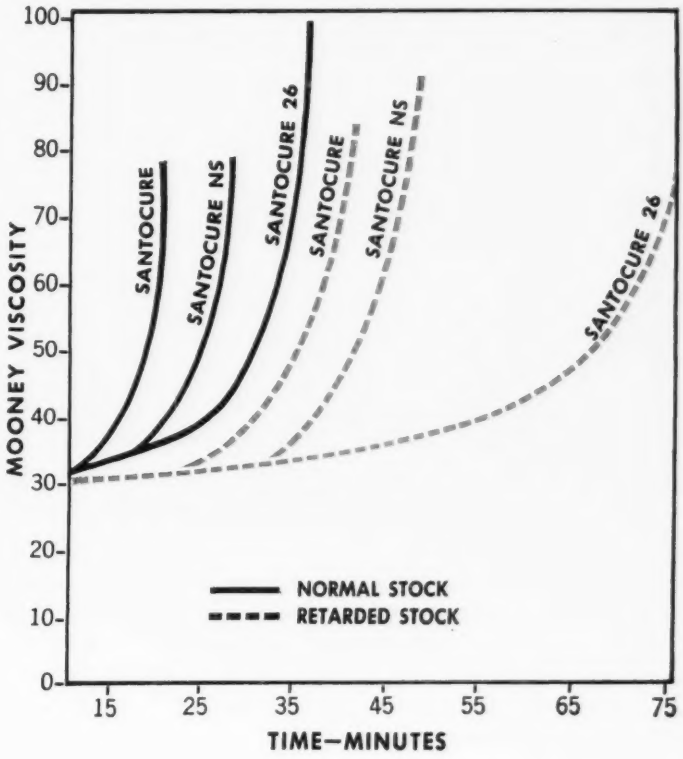

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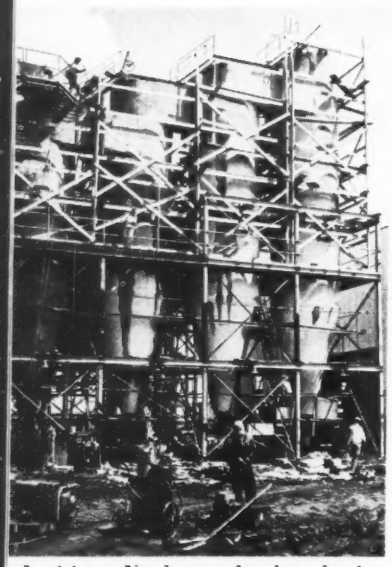
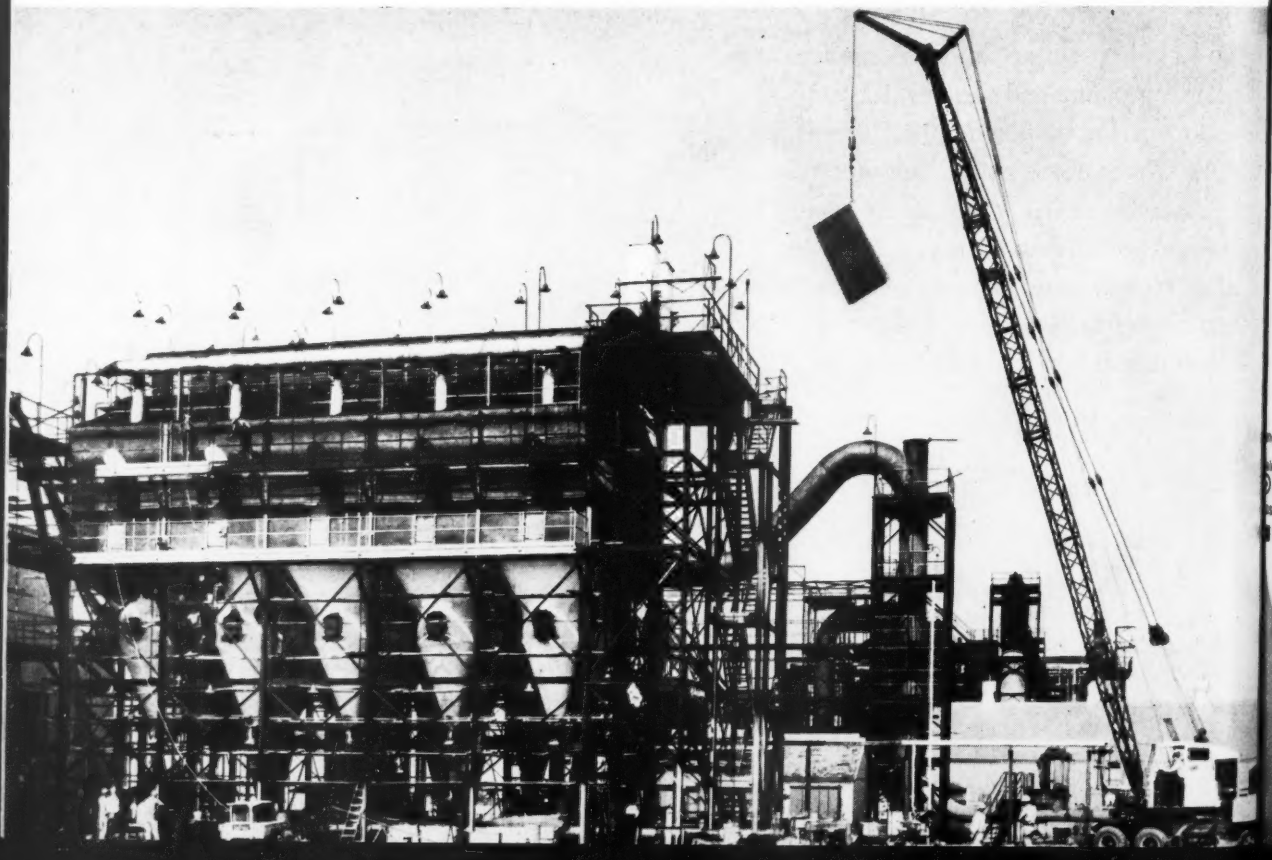
The demand for quality carbon black by the rubber industry, both here and abroad, has reached a record-breaking level. And within the next few years, this demand is expected to increase even further. To keep pace with these carbon black requirements, Witco-Continental is engaged in a major expansion program to increase the Company's production capacity 50 per cent. New plants are being constructed in California, France and Italy, while a new plant in The Netherlands has now been completed. New additions also have recently been completed for present facilities in Oklahoma and Louisiana. Naturally, new laboratories are also being built to assure Witco-Continental customers the finest technical and other services.

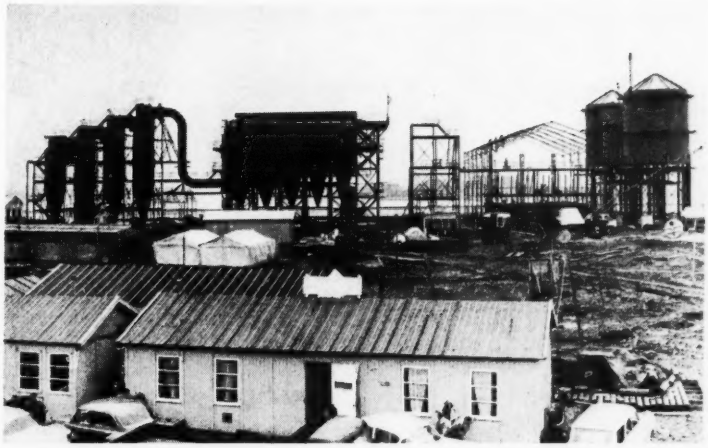


Louisiana: Newly completed production facilities for 25,000,000 lbs per year have just been brought on stream at Westlake to help meet the demand for premium quality carbon blacks.

Oklahoma: The new facilities which were added to the Ponca City plant in 1959 increased production at this site by 25,000,000 lbs per year. This new addition has fully instrumented production controls as do all Witco-Continental plants.



our CARBON BLACK DOLLAR at Witco-Continental



Europe: Steadily increasing demands for Witco-Continental carbon blacks have led the company to establish plants, laboratories, and sales offices on the Continent. A 30,000,000-lb-per-year plant has been completed at Rotterdam, The Netherlands. A 56,000,000-lb-per-year plant is under construction at Bordeaux, France, and a new 60,000,000-lb-per-year plant is under construction in Trecate, Italy.

California: The first carbon black plant ever to be built on the West Coast will be constructed by Witco-Continental. Located at Bakersfield, California, it will produce 30,000,000 lbs of oil furnace grade blacks per year. This photograph of the new oil furnace addition at Ponca City, Oklahoma is similar to the plant being constructed in California.

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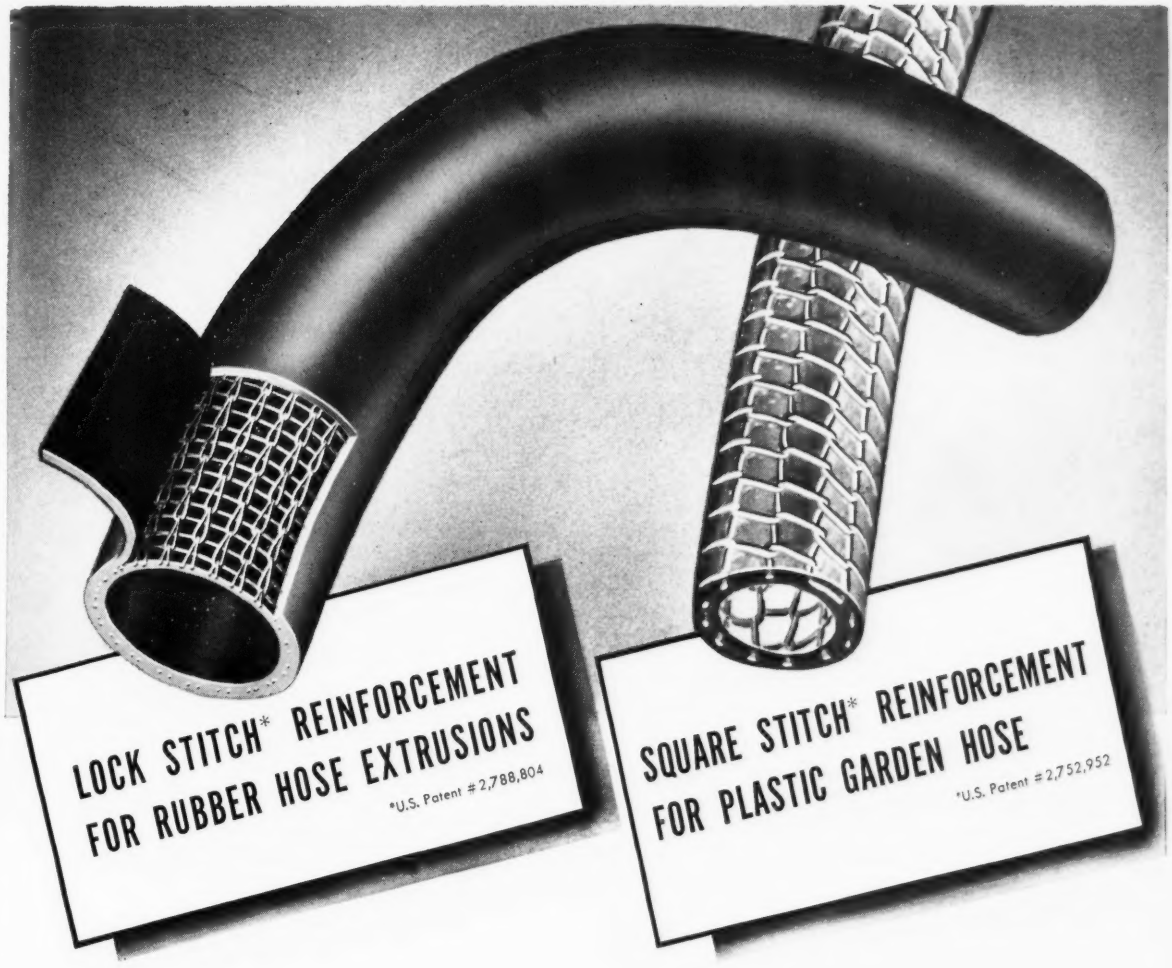

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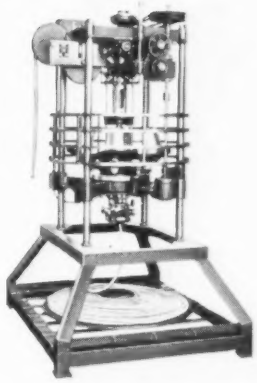

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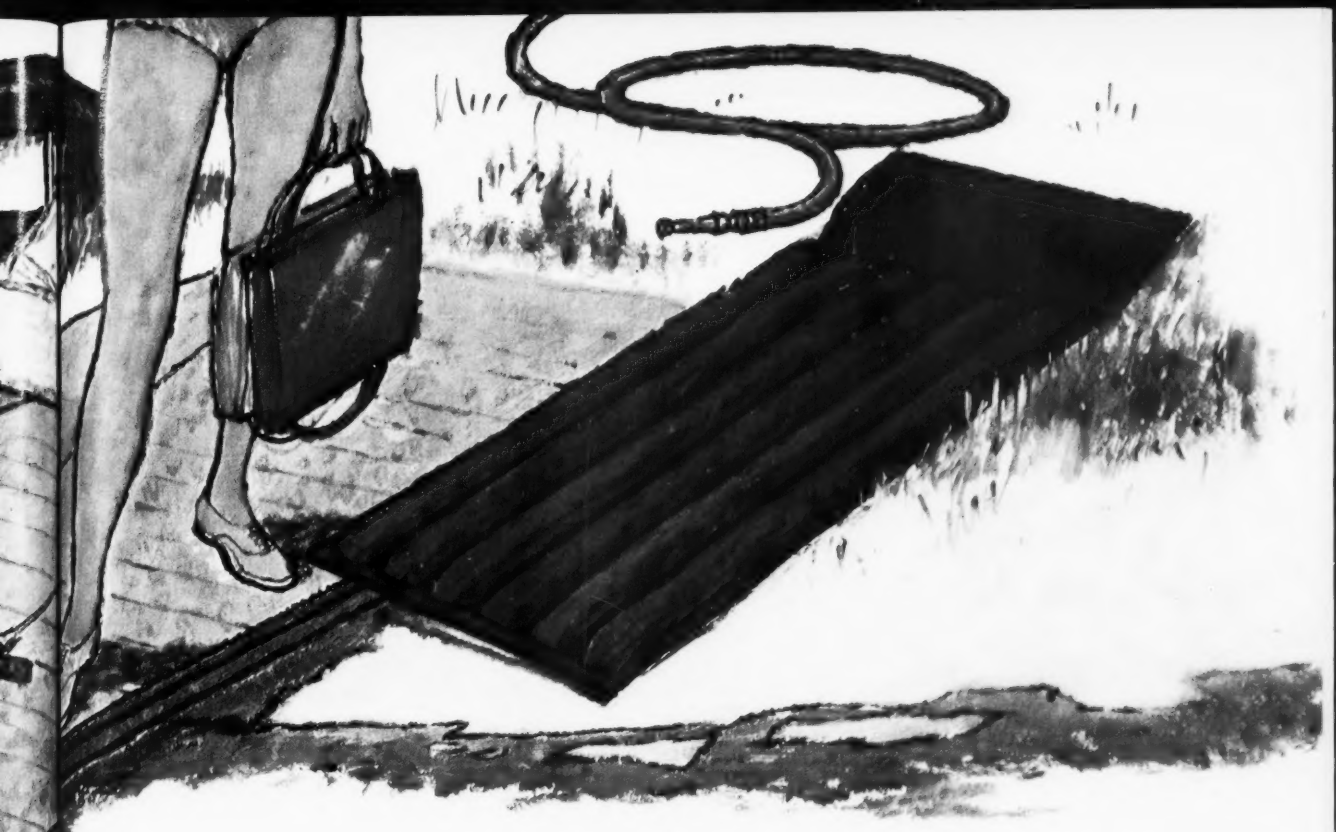

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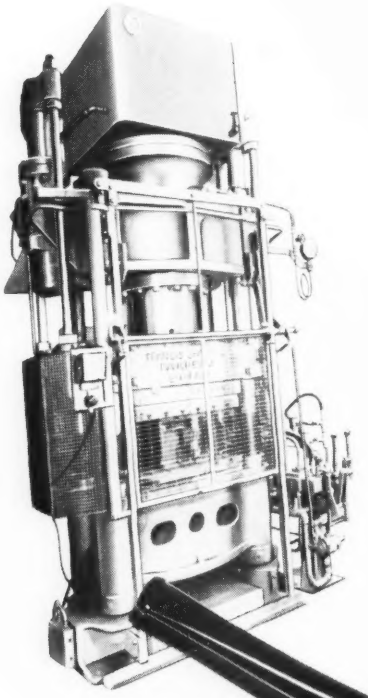

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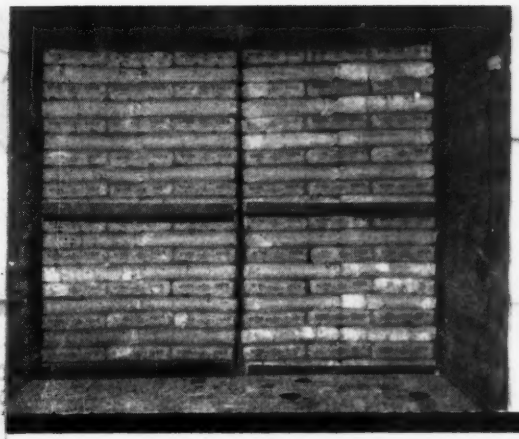

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ORLD

editorial

New Synthetic Rubber Institute Should Further Worldwide Progress

Producers of synthetic rubber in the United States and Europe have made a commendable decision to join together in the formation of an International Institute of Synthetic Rubber Producers for the promotion of international trade and the exchange of technical information on their product. In view of the existence for many years of the Natural Rubber Development Board representing natural rubber producers of Southeast Asia, this action by synthetic rubber producers is highly desirable and necessary, as mentioned in this column in June, 1960.

Bancroft Henderson, managing director of the new Institute, in announcing its formation in late July, called attention to the continued and dynamic growth of the worldwide synthetic rubber industry and the need of a producers' organization. Free World production of synthetic rubber rose from 440,331 long tons in 1949 to 1,640,000 long tons in 1959.

Membership in the Institute is open to any interested and qualified manufacturer of synthetic rubber. The membership will be subdivided into sections, however, because industry needs may exist in certain geographical areas which are not common to manufacturers in all parts of the world.

Subdivided or not, the Institute should be much more effective than individual producers in handling such matters as export-import problems and the problems of domestic producers in the several countries involved. In the United States, for example, there are many problems in connection with grading, packaging, and shipping of general-purpose SBR that may be resolved more quickly by continuous cooperative effort. Also, the aim of U. S. producers to reduce the number of black and oil-black SBR masterbatches on the market, without working hardship on the consumer, now may have a better chance of accomplishment.

It is interesting to note that one of the stated purposes of the Institute is "to fill the need for a forum in which manufacturers and technicians all over the world may exchange technical ideas and information to encourage scientific advances within the synthetic rubber industry." Is this exchange of ideas likely to lead to any coordination and cooperation in the industry's research and development efforts? Traditionally the rubber industry in this country has opposed cooperative research for competitive reasons. The amazing growth in the number and types of synthetic rubbers in the last decade, however, has multiplied greatly the number of research problems aimed at obtaining information on the underlying science of the formation and properties of these new polymers. There might be some merit to considering some degree of joint effort on such long-term fundamental research problems.

Another place where the Institute should be able to fill a long felt need is in telling the story of synthetic rubber, not only to its customers and prospects, but to the rest of the business world and the public at large. In spite of the efforts of individual producers and the annual U. S. Attorney General's report on "Competition in the Synthetic Rubber Industry," the facts and figures of this industry could be more frequently and more effectively presented.

We think the formation of the new Institute is a very wise idea, and that it should provide an unusual opportunity for the producers to further the progress of synthetic rubber and the rubber industry as a whole throughout the entire world.

R. G. Seaman

EDITOR

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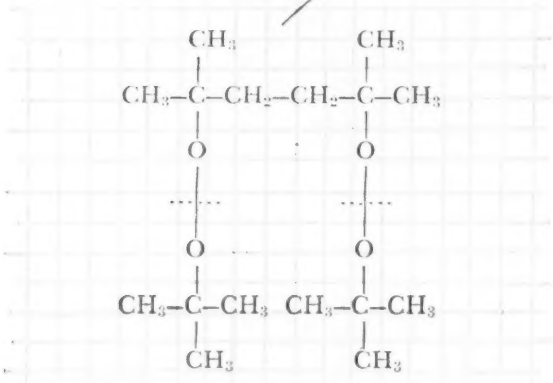

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W. B. Wiegand

Determinants in Research[1]

How certain determinants plus action provided for successful research achievements

By W. B. WIEGAND
Old Greenwich, Conn.

THE idea and title for this lecture resulted from a discussion several months ago on a New York-bound train from Connecticut with a neighbor and associate who had taught chemistry at McGill University in Montreal, Canada, during my early days at that university. After offering his congratulations on my selection as the 1960 Charles Goodyear Medalist of the Division of Rubber Chemistry of the American Chemical Society, he cautioned me against preparing a lecture to include just facts, stating that he would prefer to hear about how new concepts originated and what led up to them. The idea seemed worth trying; so, after reflecting on personal experiences over the years, the above title emerged.

A determinant, says Webster, is a cause that fixes the nature of that which results, as, "Environment is an important determinant of character." Here are six determinants in research, with brief comments:

RESEARCH DETERMINANTS

I.	The Teammates	Plus Action[2]
II.	Resourcefulness	
III.	Trend Lines	
IV.	Inversion	
V.	Hunches	
VI.	Contacts	

Comments on Research Determinants

I. The Teammates

The predispositions and training of the research group will control the outcome of long and costly ventures; basic researches may take upwards of seven years. The director is expected to be at once scientific and practical, personally warmhearted, but financially cold-blooded, with his eye fixed on the future, but his ear cocked for the present. His teammates should be chosen as carefully as his own helpmate and accorded like consideration. They should be strong where he is weak, various in temperament and training, cooperative rather than compliant, and treated with respect, appreciation, and, above all, deliverance from anonymity.

Prof. James Bryant Conant, former president of Harvard University, has insisted that a researcher is

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AMERICAN CHEMICAL SOCIETY
MAY 5, 1960

[1] Charles Goodyear Medal Award Lecture presented before the Division of Rubber Chemistry, ACS, Buffalo, N. Y., May 5, 1960.

[2] When this list was shown to W. J. Sparks, the 1960 chairman of the Division of Rubber Chemistry, his comment was that he would be inclined to add to each item, "Plus Action." This warning against endless brooding is gladly incorporated.

as much entitled to *identification* with his creations as an artist with his paintings. So treated, they will cheerfully carry their harried director on their shoulders.

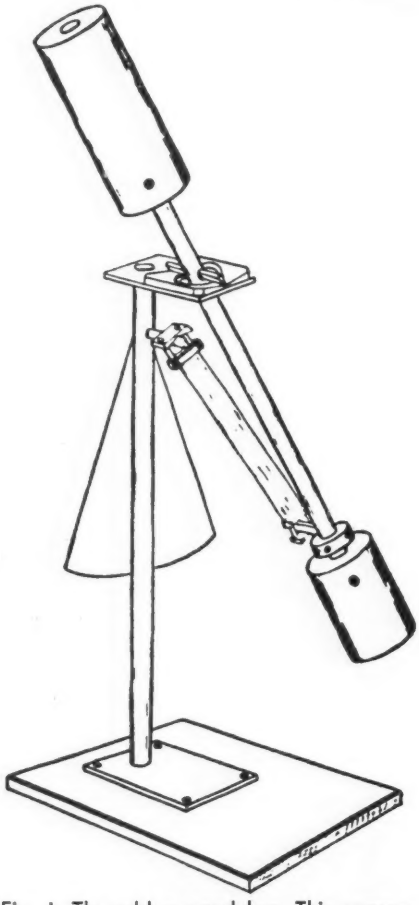


Fig. 1. The rubber pendulum. This apparatus consists of an ordinary pendulum of slow period which contains a rubber member attached to the bob; the other end is fixed to the upright support. The rubber is stretched to about 300% elongation. Behind the upright is a metal sector so arranged that when the pendulum has reached the extremity of its swing, the rubber strip is clear of the screen. During the rest of the oscillation it is in the shadow. Behind the pendulum is an ordinary electric heating unit with a copper reflector. The Joule effect is brought into play by starting the pendulum. The radiant heat shrinks the band, pulling back the bob. Then the band cools off in the shadow of the sector and thus allows the bob to swing out to the other side, whereupon the band once more is heated by the radiant energy, contracts, and so repeats the oscillation, which continues as long as the heat energy is radiated in this manner. When the electric current is shut off, the pendulum dies down[4]

II. Resourcefulness

By this I mean imagination and flexibility in working theories, together with contrivance and improvisation in the laboratory. It is possible to be too flexible; there is a happy mean between flitting and roosting.

The laboratory researcher who has a flair for the critical experiment, and who can both see, and seize, the value of the unexpected result, should almost never be promoted to an executive post. Instead, he should receive, shall we say, about double the salary of this chief! Technical vision is not less Olympian than supervision!

III. Trend Lines

Trend lines are essential and not always pedestrian. Sharp deviations from a sought-after trend may, if confirmed, provide an entirely new approach to the current problem.

IV. Inversion

When one has run out of working theories, and the trend lines look as wide as they are long, it sometimes pays to turn the prevailing theory upside down. An example or two will be given.

V. Hunches

Hunches are subconscious integrations which women use automatically, men more covertly. A good huncher will enrich any team. Too many hunches can be unsettling, but a brilliant hunch may lie close to a real stroke of genius.

VI. Contacts

Any researcher is the better for exposure to the disciplines and insights of arts and sciences outside his specialty. Such encounters, be they with pure scientists, or moderately pure poets, prelates, or scholars, will widen his horizon, stir his imagination, and aid the incubation of his own research thinking.

Some Researches and Their Determinants

Reinforcement and a New Trend Line

In a paper published in 1920 (1),[3] the conclusions ran:

"In general, it would appear that the predominating influence in reinforcement is the capacity factor or surface energy, namely, the specific surface, or degree of subdivision of the pigment."

The intervening forty years do not appear to have upset this inference. Originally proof of this early theory of reinforcement was a seven-year job (1913-1920) in which three of the determinants were involved.

The teammates were H. A. Braendle, physicist; R. D. Gartrell, chemist; and H. F. Schippel, electrical engineer. Braendle, who had taught physics at the University of Toronto, was in charge of compounding and

[3] Numbers in parentheses refer to Biblography items at end of article.

[4] Sketch and explanation from *Trans. Inst. Rubber Ind.*, Oct., 1925.

testing. The pagan rites of prevailing compounding were already anathema to him.

Gartrell, Georgia Institute of Technology chemist, developed a new mounting technique (2) by which he was able, for the first time, to prepare microscope slides of carbon black free from flocculation. He resolved the carbon black particles to a value of 80 millimicrons (3), a figure which was not bettered until the advent of the electron microscope 20 years later. The other pigments of the day were similarly studied. They gave values for specific surface ranging from 30,000 square inches per pound to 2,000,000.

H. F. Schippel, a McGill University electrical engineer, and also an expert machinist, devised a new and refined technique for measuring the volume increase, under strain, of cured, pigmented stocks (4). He proved that vacuoles were formed, and that coarse pigments developed much larger vacuoles than fine pigments.

Here, then, were three teammates, representing quite different disciplines, who had shown by means of improved experimental methods that pigments differ in their adhesion to rubber and that the finer pigments adhere better than the coarser ones. What was of greatest importance was that they had obtained quantitative data on these parameters. It remained to supply a new measuring stick for reinforcement, that is, the proof resilience or rupture energy of the vulcanizates. When Gartrell's fineness data and Schippel's vacuole data were plotted against rupture energy data obtained by Braendle (1), there merged a new trend line, a rationalization of the reinforcement syndrome in terms of specific surface, and the coronation of carbon black as king of the rubber pigments.

Outstanding teammates, I, resourcefulness, II, and trend lines, III, the first three determinants on our list, played the dominant role in the successful completion of the reinforcement project.

Thermodynamics and a Hunch

One afternoon in about the year 1920, the Joule effect was being demonstrated in a lecture at McGill University. Rubber bands were strung from a high ceiling and stretched by a weight to around 400% elongation. When a battery of Bunsen burners was placed underneath these stretched rubber bands, the weight leaped upwards; when the burners were removed, the weight sagged. The onlookers seemed impressed by seeing heat induce contraction.

The lecturer, however, saw Carnot's cycle; a reversible cycle with heat absorbed at high temperature and then discharged at a lower one. He had a hunch that here was a potential heat engine and one from which work must result. H. F. Schippel, the teammate with mechanical genius, designed and constructed two rubber heat engines, one reciprocating, the rubber pendulum (Figure 1); the other rotating, the rubber motor. (Figure 2) (5).

The rubber pendulum was only a scientific curiosity or a lecture demonstration of the second law of thermodynamics. Nine years later in New York, however, teammate John W. Snyder set up a simple, but elegant apparatus by which we were able to generate reversible

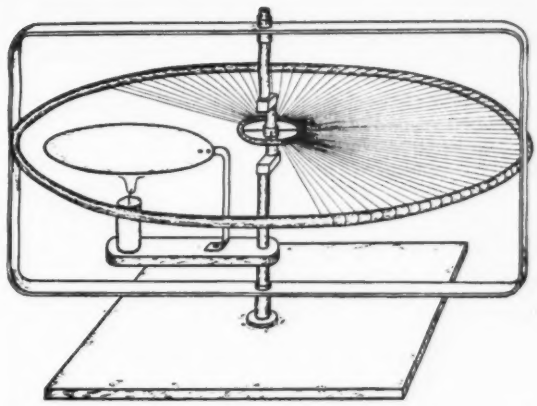


Fig. 2. The rubber motor. An outer ring is supported on a frame revolvable around the main axis. An inner ring, revolvable around another axis eccentric to the main axis, is connected to the larger ring by stretched rubber bands. When the two latter rings are made to rotate about their axes, each band will traverse a cycle of expansion and retraction. The heat from a candle radiated from a small plate is made to reach a section of the bands at a point shortly after they have reached the point of greatest extension. The Joule effect becomes operative; the bands contract, exert a moment about the axis, and thus cause the frame to revolve. The speed of the motor can be regulated to some extent by advancing or retarding the position of the hot plate in relation to the point of maximum extension[4]

cycles similar to those of the pendulum over the whole elastic range of vulcanized rubber, and at two temperature levels.

Using thermodynamic equations already published by R. H. Gerke (6), we were enabled to determine the internal energy and entropy values of the rubber up to 718% elongation. The pendulum technique made it possible, for the first time, to evaluate a self-reinforcing elastomer in thermodynamic terms, into and throughout the whole range of crystallization. The pendulum episode would seem to illustrate the truism that the top of today may become the tool of tomorrow.

In 1925 a rubber heat engine, operating by Carnot's cycle, was described in the literature (7). Ten years later a study was published on the entropy, internal energy, and crystallization effects for natural rubber bands throughout their entire elastic range (8). The experimental technique was an application of the reversible cycles by which the rubber pendulum operated, as mentioned in the preceding paragraph.

Teammates Schippel and Snyder had, by the application of new and elegant techniques, confirmed the original hunch and made possible the thermodynamic analysis of elastomers in the crystallizing range. The determinants I, II, and V, were important in this work.

Another Hunch and Dustless Carbon Black

Later in 1925, as research director for Binney & Smith Co., a former Columbian Carbon Co. affiliate,

my first assignment was the dusting problem, which had enshrouded the king of rubber pigments in a murky gloom from the very beginning. Eight years elapsed between the inception of an idea and full commercial production of dustless carbon black. A product patent was granted, litigated, and sustained—a long-drawn-out, but rather basic advance in the black art. Here is how it came about!

Our teammate was Louis J. Venuto, who made up in brilliance what we lacked in numbers. Our working theory involved rejection of binders, elimination of mudcake, avoidance of a free meniscus, of vortex action, and of close piling during concentration. The technique was to make a slurry of carbon black and water and then to displace the water with a small amount of a second liquid which had preferential affinity for carbon black. This combination would deaerate without involving mudcake conditions.

One day Venuto was performing the above-mentioned operation for the hundredth time. In a separatory funnel he had his thin paste of carbon black in water, to which he had added a small amount of gasoline. Then, as usual, he shook the mixture. The first result was thickening; next, preferential wetting took place in the form granulation, flocculation, followed by phase separation. Finally, a curd rose to the top, which contained the carbon black, wetted with a small amount of gasoline. This curd, when dried, would produce a deaerated carbon black conforming to the requirements of our working theory.

But this time Venuto did not stop, he kept on shaking the mixture in the separatory funnel, and, when he glanced at the funnel, his eyes popped. The curd had disappeared, and in its place he saw what looked like black caviar, myriads of small, perfect, shining spheres. (See Figure 3.) Dustless carbon black, in bead or pellet form, had been born (9). Figure 4 shows a modern hopper car being filled, one of the results of the culmination of this research, with carbon black beads from storage.

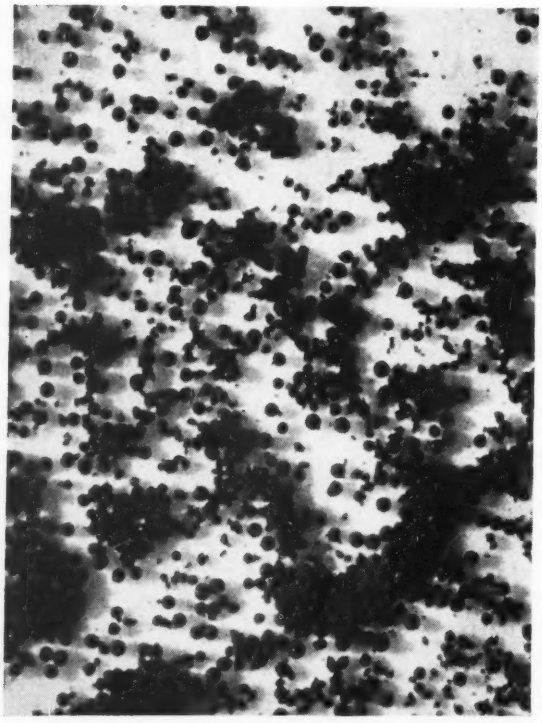
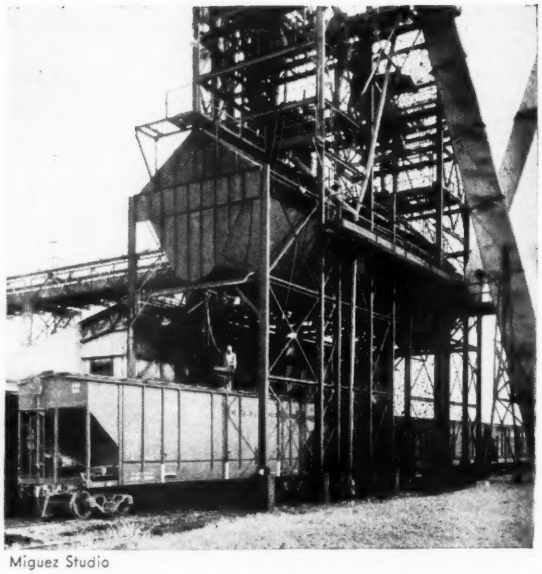


Fig. 3. An early photomicrograph of dustless black



Miguez Studio

Fig. 4. Beads of dustless carbon black in process of being loaded into a modern hopper car

On a hunch, Venuto had achieved a result which was unexpected and which went far beyond our working theory. Also, he recognized the importance of the result. He had shown himself a master of serendipity, to use a word with which A. M. Gessler, of Esso Research & Engineering Co., is fain to bemuse his friends.

Teammate Venuto had climaxed our sound working theory with a brilliant hunch; the determinants in this instance were numbers I, II, and V in our list.

A Hunch, a Contact, and the pH Test for Carbon Black

First described some 20 years ago, the pH test for carbon black has been rather generally adopted as an overall clue to the oxidative nature of the surface of carbon black and, therefore, to the method of preparation of an unknown black.

The idea for the pH test for carbon black arose from a contact made during a delightful sail on Long Island Sound one Sunday afternoon, with a college classmate, the late Kenneth Burgess, of the Magnetic Pigment Division of Columbian Carbon Co. Burgess was explaining the importance of minute control of residual acidity in iron oxide colors. His method, he said, was to boil the pigment in water and pour off the supernatant liquid, to which he then added an indicator for a colorometric pH.

Carbon black was also a pigment with an acidic surface. Was it possible that the Burgess test might give a

reading despite the absence of free acids in carbon black? At sundown the sail ended, but not the hunch. The job of adapting the Burgess test to our pigment was completed in short order by Carl W. Sweitzer, then at Mellon Institute, assisted by W. C. Goodrich and W. C. Ekholm, and aided by suggestions from John Snyder. When the glass electrode of a pH meter is immersed in a colloidal carbon black sludge, it may give readings from two to eleven (10).

Yachting can be a productive way of conducting research, provided you have the proper crew, a vagrant hunch, and the "Sparks-"plug of action. The controlling determinant was a contact, followed by a lucky hunch, implemented by expert laboratory work on the part of our teammates; the numbers were I, II, V, and VI.

An Inversion—and the Discrete Rubber Theory

This discrete theory of rubber reinforcement (11) was propounded as a means of reconciling certain anomalies inherent in the assumption that pigment particles are dispersed in a continuous phase of rubber. Instead, rubber was pictured as the discrete phase, embedded in a matrix of carbon black particles. The theory was commended, and rejected; latex particles just don't survive in a finished tread stock!

Now, two decades later, electron micrographs reveal, to quote Donald Parkinson (12), that "the clear areas are reminiscent of a theory of reinforcement presented by Wiegand in 1937. Regions devoid of carbon do seem to exist, and some of the particles assume configurations roughly as postulated by Wiegand."

Doubtless, a fondness for inversion can be overdone!

The Furnace Overtakes the Channel—a Conversion Due to Inversion

In December, 1938, (13) it was announced that working samples were available of a furnace carbon black equal in reinforcement to channel carbon black. In a mercaptobenzothiazole-accelerated furnace black-tread stock, tensile strength, tear resistance, and rupture energy were equal to, and hysteresis lower, cure time shorter, than comparable stock containing channel black. By 1943, Statex furnace black sales reached upwards of 5,000,000 pounds. Upwards of seven years went by between inception and commercial fulfillment of the idea for reinforcing furnace black. Of the researches here reviewed, this one was the toughest. Now to present a brief summary of the antecedents.

The teammate was our old companion at arms, H. A. Braendle, who as usual bore the major load; the place, the languid bayou country of Louisiana. We had two staunch helpers, Robert Cobb and the late C. W. Nichols.

We were faced at the outset with two psychological obstacles. The first was a report to our management from the largest furnace carbon producer that it had just dropped a half-million dollars trying to reach channel black quality and had quit. The second was the almost mystical faith in the impingement process which permeated the whole industry. On the cheerful side we had, despite limited funds, unlimited scope and time, nothing to deflect us from our target and three long-range completed projects behind us.

The first furnace was square, made of metal sheeting, insulated with earth roughly boxed in; weeds sprouted from the top. (See Figure 5.) Our working theory was simply to inject a natural gas blast flame into one end as a source of heat, then downstream to inject "make" gas through four tubes. Farther down, a water spray quenched the reaction. With this furnace, and also with its better engineered successor, the struggle for upward slanting trend lines, i.e., pointing towards channel rubber properties, went on for weeks and months, several years, in fact. There were two reasons for this prolonged frustration, one of which was our inability to generate single-variable trend lines.

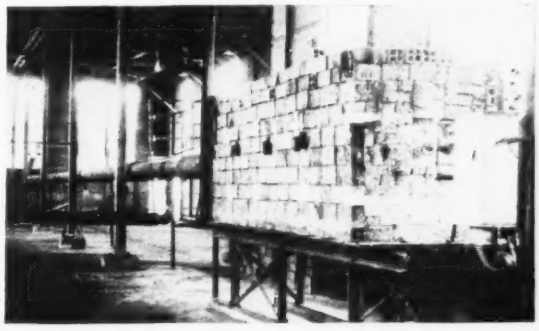


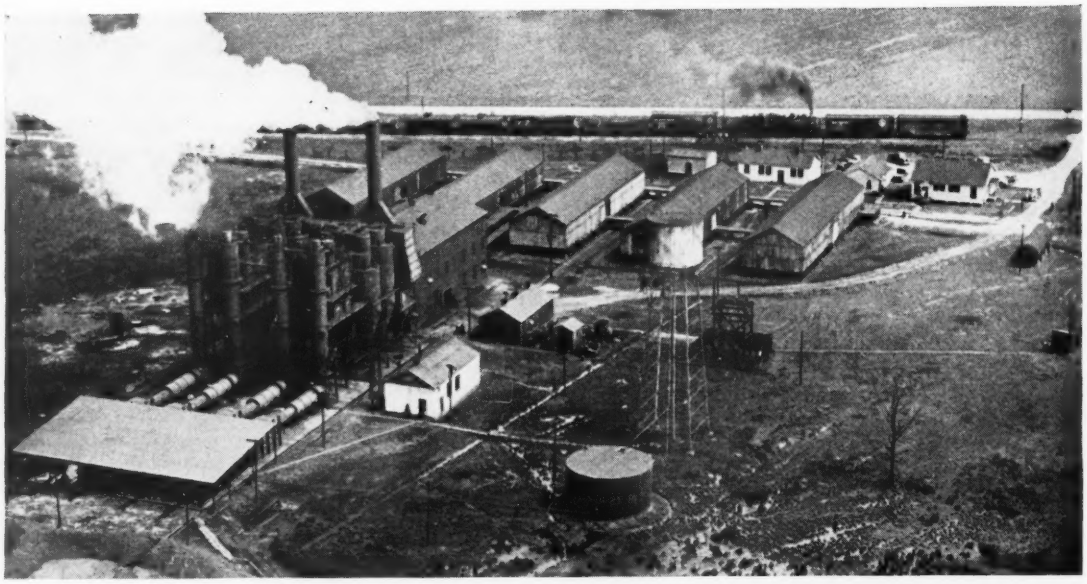
Fig. 5. Early furnace used for the development of reinforcing furnace carbon black

Take a simple example; if you raise your blast ratio for more oxidizing conditions, your total air to gas ratio will also shift. Then, if you compensate, you introduce a new variable which requires running down. In furnace carbon black research multi-variable changes are inevitable and vexatious. One has to learn to live with them.

The second reason was that we were operating on wrong assumptions; our working theory was inadequate. The solution was the complete rejection of the classical carbon flame—smooth, unruffled, quiet—and the adoption of its opposite, that is to say, inversion. The doctrine of streamline flow had a written tradition of 600 years. Some turbulence could, in fact, be tolerated, despite loss in yield, but extreme roaring turbulence; you just couldn't make carbon black that way. Why? Because there would be no flames at all, nothing but Dante's Dread Inferno. The hunch to go the whole hog, to forget about the flames entirely, was the inversion that saved the day.

A new high-pressure blower was installed; the load drastically increased; contact time reduced. Air and gas ratios, cut-off spray, etc., had to be worked out, but now things began to happen. Trend lines came to life and slanted upwards, particularly for the rubber tests. By June, 1938, samples were ready; public announcement followed in December.

During the past two decades furnace processes and products have been greatly improved and extended in



Newcomb Studios

Fig. 6. Aerial view of modern reinforcing furnace black plant

range. This fortunate situation is due to the outstanding research and engineering contributions by the whole carbon black industry. It is both a pleasure and a duty to make this hearty acknowledgment. Now the squeak and squeal of the channel plants have given way to the deep and steady hum of the furnace (14), a technological revolution, a conversion due, in the first instance, to an inversion!

Figure 6 is a view of a modern furnace carbon black plant; note that the smoke from the stacks is white in contrast to the smoke from the locomotive on the track in the rear of the picture.

The determinants were an imaginative and determined teammate, I; a prolonged struggle with our working theories, II; and our trend lines, III; a hunch that some drastic change could be found, V; and, finally, inversion, IV.

Another Contact and the Electron Microscope

On June 10, 1940, what was formerly the *News Edition* of *Industrial and Engineering Chemistry* carried the announcement that "Electron photomicrographs of carbon black reveal spheroidal particles ranging from less than 10 to 60 millimicrons, the smallest particles approaching molecular dimensions . . . a surface twice as great as previous estimates . . . absence of burr or feather-like structure . . . a new conception of specific surface development" (15).

Well, this research project also began with a contact and was, from the beginning, a race against time. In May, 1939, during a luncheon and chat with a favorite professor, E. F. Burton at the University of Toronto, he told about the new electron microscope which he and his star students, C. E. Hall, A. F. Prebus, and J. Hillier, had just constructed. He showed a paper just published by Prebus and Hillier, in which biological specimens were photographed at unheard-of magnifications. The implications were obvious. We learned that Burton was short of funds, made on the spot financial arrangements, ending in a Columbian Carbon Fellowship. Within a month work began on our samples of carbon black. Within a year Prebus and W. A. Ladd took the first perfect picture of Micronex channel carbon black. (See Figures 7 and 8.)

Another year, and Ladd had built a duplicate instrument for Columbian Carbon. With his talented wife he came down to join our team and operate the instrument which he had built. Within another year Ladd had completed the first distribution curves and definitive surface area calculations for the various carbon pigments. Soon there followed the first pictures of carbon black chain structure (16), of carbon black in cured treads, and of carbon black gel (17). (Ladd now operates his own electron microscope laboratories where his talent finds ever-widening scope.)

A routine luncheon with a favorite college professor had opened the door to a new wonderland. The determinants, in addition to the original contact, VI, were the virtuosity of teammate Ladd, I, II, and action.

Summary and Conclusions

We have now outlined some of the precursors of research, which we have called determinants. As to teammates, the record shows that the writer has been fortunate beyond his due. Flexibility in working theories, together with resourcefulness in techniques, prerequisites in any major research project, turned up when most needed. Trend lines, followed by extrapolation, we found essential, but tricky. Inversion, although great fun, is more a heady wine than a steady diet.

The relatively high incidence of hunches and contacts, as decisive factors in research, emerges as perhaps the highlight of this modest study. These are determinants which seem to be independent of formal

Fig. 7. First electron photomicrograph of commercial carbon black (Micronex—1940)

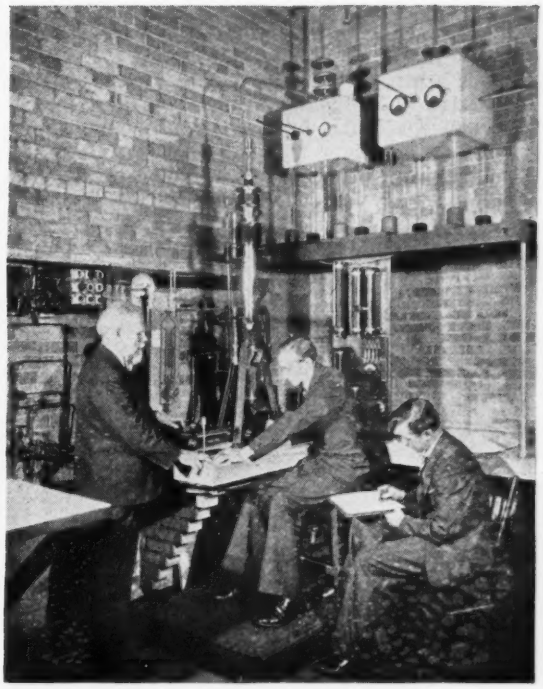


Fig. 8. Early electron microscope and, *left to right*, E. F. Burton, A. L. Prebus, and W. A. Ladd

training; they are not to be found in college curricula. Even application forms do not ask "What is your record in successful hunches?" They are qualities which belong to other than the cognitive side of man. The same might be said about action, which, as Dr. Sparks has reminded us, is an indispensable adjunct to any list of prerequisites for research.

But how are these non-intellectual determinants fostered? How do certain individuals acquire the spark which seems to kindle their creativity, their hunches, their flair for extracting honey from their contacts, their drive, their motivation? Well, motivation seems to tie up with feeling. The Greeks thought that feeling centered in the diaphragm. With us it is the "heart". In neither case is it the head. How does one go about acquiring this spark?

In classical Greece, kings and potentates sent their sons to one of two schools, not to learn certain skills, but to be exposed to two men, Plato and Isocrates. They counted on contact with these great teachers to inspire their sons, and they rated this inspiration above instruction. Are we, perhaps, inclined to overrate curricula and underrate the importance of person exposure to teachers who possess, and can communicate, the imagination, the sweep, and the scope which we associate with greatness?

These attributes belong to the essence, the spirit of man, and research is assuredly an affair, not only of the mind, but also of the spirit, which alone can fire and inspire, each of our determinants of research. This spark, this contagion, cannot be learned or taught; it has to be caught. So here's wishing you all—good catching!

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REPRINTS OF THE ARTICLE, "AVAILABLE DRY Styrene Rubbers (SBR)—United States and Canada," which appeared in our August issue are available at 10¢ a copy. Anyone desiring one or more copies of this revised, up-to-date listing of currently offered polymers may order them from the editorial offices of RUBBER WORLD.

Coatings for Molded Rubber Products[1]

Advances in polymer and coating technology provide for improved performance

By R. L. HAWKINS, JR.
Empire Varnish Co., Cleveland, O.

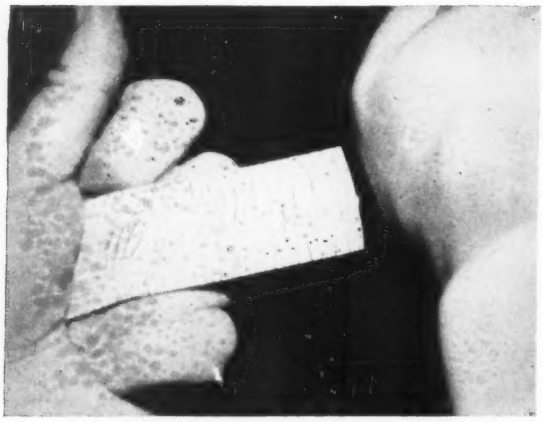

Fig. 1. Cracking of unsuitable coating material on stretching, due to brittleness

WHEREVER coatings are used these days, it is difficult to enter into a discussion of their properties and merits without mentioning color and other appearance factors. Appearance factors are the properties of a coating which are most easily noticed and evaluated. Along with these attributes, other properties such as weatherability, flexibility, hardness, abrasion resistance, chemical resistance, and other features are usually desired. Decorativeness, however, remains one of the primary aims of those who specify coatings.

It is only necessary to look around us to observe the revolution which has taken place in the last decade in the use of color in homes, automobiles, toys, furnishings, and office equipment, which have all shared in this demand for color. The use of rubber products is certainly strong in all of these markets, and the same psycho-physical aspects of product design are just as important with rubber products as with all of the others mentioned.

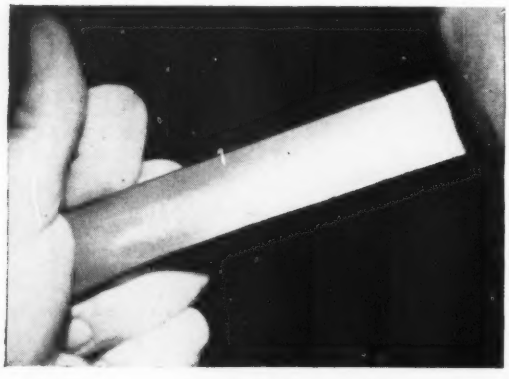

Fig. 2. Satisfactory coating material shows no cracking on stretching of the SBR base material

Coatings and Materials

Rubber goods may be integrally colored, or they may have a coating applied to them to achieve bright colors or to modify otherwise the appearance and properties of their surfaces. It is frequently more economical to use coatings for these purposes, and these coatings sometimes have other advantages as well, such as superior abrasion or ozone resistance.

TABLE 1. POLYMERS FOR COATING RUBBER PRODUCTS

Polyacrylates
Poly(vinyl chloride) copolymers
Polyvinyl acetates
Styrene-butadiene copolymers
Butadiene-acrylonitrile copolymers
Polychloroprenes
Chlorosulfonated polyethylene
Catalyzed epoxy resins
Catalyzed polyurethanes

Coatings cannot be used in all cases for rubber articles, however, since either manufacturing or service use considerations may make it necessary in many instances to work with only integrally colored materials. Balls, toys, gaskets, motor mounts, home and automobile mats, rubber footwear, and cove molding represent some of the products where the use of coatings has been of interest.

The possibility of providing superior performance for the finished rubber product is particularly noticeable when considering the use of polymers available today for coating work. Table 1 indicates some of the basic polymers which might be considered for coating rubber substrates. Properties such as high tensile strength, high elongation, minimum irreversible stress relaxation, and resiliency are available in these single polymers or in blends of these polymers.

[1] Presented before the Division of Chemical Marketing & Economics, ACS, Cleveland, O., Apr. 8, 1960.

Effective coatings are thus available which simply could not have been made a few years ago, either because the necessary polymers were not available for coatings in the necessary physical state or because coating technology had not progressed to the point where some of these polymers could be utilized. For example, Figure 1 shows a typical failure due to brittleness or lack of elongation of the coating material, a type of failure which used to be common. Figure 2 shows a coating made under present-day conditions of polymer and coating technology which provides proper performance. In each case the coating had been applied to a styrene-butadiene rubber (SBR) base, and the base subsequently elongated as noted in the illustrations. The surface cracks seen in Figure 1 occurred in the coating itself; while the coating seen in Figure 2 shows no such failure under similar conditions of elongation.

The example mentioned in the preceding paragraph does not mean that some of the older polymers are not without value for coating work; rather it might be said that the availability of some of the newer materials, and advances in coating technology, make it possible to enter fields of application previously inaccessible.

Use of Water-Dispersed Polymers

While some of the newer polymers, particularly the epoxies and polyurethanes, may be applied from solutions in organic liquids, the most useful properties for coating work are best available frequently from the water-dispersed forms of these polymers. The reason for this situation is obvious when one considers that the properties sought in the coatings are improved with increased molecular weight of the polymer used. Such high molecular weights become unmanageable in solutions because of their high viscosity, the obtainable solids contents are low, or the application characteristics are difficult. Although water-dispersed coatings may not dry so rapidly as some solutions or lacquers, satisfactory production schedules may be maintained with water dispersions with forced air drying equipment, if necessary.

Mechanical Properties of Coatings

To illustrate further the properties of the materials necessary for use in coating rubber products, the stress-strain curves for various coating materials must be considered. The properties of polymers represented by curves A, B, and C (Figure 3) would not be suitable for use in coating many rubber products because of the relatively low ultimate elongations. The properties of the polymers represented by curves D and E would be much more satisfactory.

The data from which the curves in Figure 3 were plotted was obtained at a rate of strain of two inches per minute, which constitutes more stringent test conditions than a lower rate of strain, since the ultimate elongation is decreased for many polymers at this rate and higher rates.[2] Stress-strain testing at two inches per minute is standard practice in the plastics industry and was necessary in order to get usable data on non-elastomeric materials. The elastomeric polymers were tested at 20 inches per minute, and under these conditions the stress values were about 10% higher than they would have been if obtained at two inches per minute, but the difference in polymers results was not considered significant in the evaluation of these for coating applications.

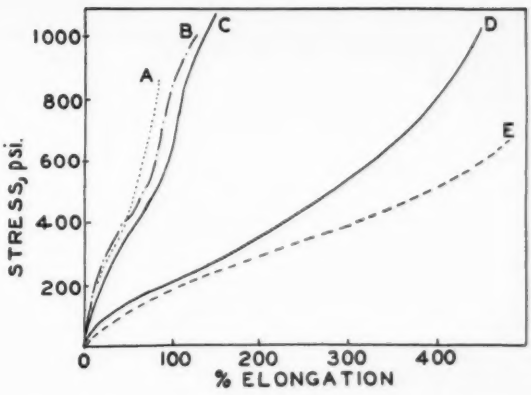

Fig. 3. Stress-strain curves for coating materials

A. Phenolic plus 85% oil. B. Poly(vinyl chloride) latex I. C. Alkyd (30% phthalic). D. Poly(vinyl chloride) latex II. E. Acrylic latex

An additional form of behavior not illustrated here, but which is typical of visco-elastic substances, is that of stress-relaxation. If the specimens reported in Figure 3 had been stopped short of rupture and run back with decreasing stress, the polymers approaching elastomers in their properties would have shown a hysteresis loop, but would still have returned to approximately their original dimensions. The other specimens would have exhibited pretty much of an irreversible form of stress-relaxation, that is, a high degree of permanent set. If and when this latter form of behavior occurs, it precludes the use of such compounds and polymers in rubber coating applications.

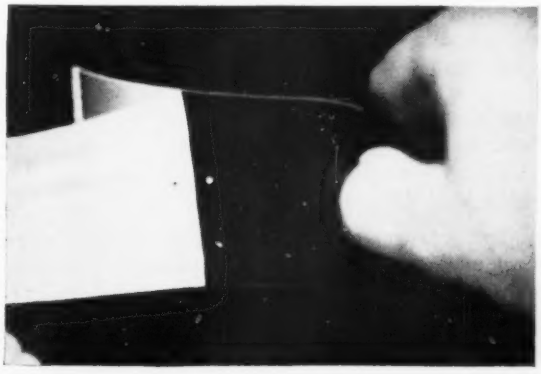

Fig. 4. Example of lack of adhesion with coating material capable of being stripped from rubber substrate

[2] R. M. Evans, H. R. Nara, E. G. Bobalek, *S. P. E. Journal*, 16, 1, 76 (1960).

Adhesion Problems

Along with visco-elastic behavior effects, the factor of adhesion is of equal importance in coating work. In fact, most coating chemists have observed at one time or another, that it is sometimes difficult from appearance alone to differentiate between elastic and adhesion failures of applied coatings.

Coatings for rubber articles present special aspects of this adhesion problem because of the frequent presence of contaminants on the surface of the rubber product. The source of these contaminants may be mold lubricants or ingredients found in the rubber compound itself. The compound recipe given in Table 2 illustrates the source of one of the most common contaminants, wax. Note that the wax content amounts to almost 5% of the total compound.

Common mold lubricants include hydrocarbon waxes, vegetable waxes, polyglycols, polyethylenes, and silicones, any one of which could cause formidable adhesion problems in coating rubber articles.

TABLE 2. RUBBER COMPOUND

Material	Parts
Styrene-butadiene rubber	100.0
Stearic acid	2.0
Zinc oxide	5.0
Sunproofing wax	10.0
Carbon black	100.0
Sulfur	2.0
Accelerator	1.5

In connection with adhesion, the improved mechanical properties of high molecular weight coatings is not an unmixed blessing, since when such coatings with high cohesive strength show adhesion failure, they may be susceptible to being stripped from the substrate and then no longer represent a satisfactory coating job. Figure 4 shows such a coating being stripped from a rubber surface.

The solution to this problem of adhesion consists, of course, in either avoiding or removing contaminants from the surface of the substrate.

There is the further problem of the frequent lack of compatibility and therefore specific adhesion between certain coating compounds and elastomers. For example, poly(vinyl chloride) and SBR are nonadhesive, and a suitable primer must be devised when you are working with these two elastomers.

Effect of Ultraviolet Light

Embrittlement and discoloration of otherwise satisfactory polymer coatings sometimes occur when the coatings are exposed to ultraviolet light. Discoloration, in particular, may become evident after as little as a few hours in a Fade-Ometer,[3] Weather-Ometer,[3] or under an S-1 ultraviolet lamp. Similar results can be obtained if the coated articles are exposed either without cover or under glass to natural sunlight for a period of months.

The cause of discoloration and embrittlement of certain coating materials by ultraviolet light is considered to be the presence of staining antioxidants and certain other ingredients in the basic recipe from which the rubber product has been made. It is of interest to note that staining and embrittlement of certain coating materials cannot ordinarily be caused by heating or oven aging at a temperature in the range of 150-170° F. The effect is therefore distinctly the result of a photochemical reaction. Since photochemical reactions are so frequently associated with the production of free radicals,[4-5] it might be surmised that this degradation of polymer coatings by ultraviolet light is a free radical mechanism. Under the worst conditions the extent of the loss of the physical properties of the coating materials can be quite drastic. With the cooperation of the rubber chemist, however, the recipe for the article to be coated can be frequently adjusted to eliminate or reduce the staining of the coating material.

Summary and Conclusions

There is a need of the decorative treatment of rubber goods as a part of the general trend for most manufactured items. Through advances in high polymer and coating technology, new materials and new methods are available for the coating of rubber articles. It is now possible to approximate the physical properties of the rubber product being coated with the coating materials, and this situation provides for the vastly improved performance of such coated rubber products.

Certain special problems in the coating of rubber articles remain, however. Attention must be paid to the composition of the rubber product being coated and to the use of mold lubricants that detract from the adhesion of the coating to the rubber substrate. Certain coating polymers and elastomer product base compounds function well together; while others do not. In the latter case, primers must be devised.

Finally, the effects of exposure to ultraviolet light on the color and physical stability of the coating material must be considered.

■

Rubber in Auto Exhibit

The Rubber Manufacturers Association, Inc., is one of the participating associations and is sponsoring displays of rubber usage in automobiles at the "Auto Wonderland" National Automobile Show to be held in Detroit's new Cobo Hall, October 15-23, under the general sponsorship of the Automobile Manufacturers Association to introduce all the 1961 models simultaneously.

[3] Atlas Electric Devices Co., Chicago, Ill.
[4] C. E. H. Bawn, "Chemistry of High Polymers," pp. 47-48. Interscience Publishers, Inc., New York (1948).
[5] E. C. Schildknecht, "Vinyl and Related Polymers," John Wiley & Sons, Inc., New York (1952).

Environmental Resistance of Estane Urethane Materials[1]

This elastomer exhibits superior gamma radiation resistance consistent with its low cross-linking value; good ultraviolet radiation resistance may be obtained with carbon black and ultraviolet absorbers

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AS SOLID, elastomeric polyurethanes gain in applications and importance, there is increasing need to know more of the response of this relatively new polymer class to various environmental conditions.

Early work done in this laboratory comparing the gamma radiation resistance of many types of high molecular weight materials showed polyurethanes to be among the most radiation-resistant of polymers, and polyurethanes the most radiation-resistant elastomers tested (1).[2] This information, supplemented with that of Harrington on polyurethane gamma radiation resistance (2a), led to a research contract[3] at the B. F. Goodrich Co. Research Center, the aim of which was to study the effects on the mechanical properties of polyurethanes of higher levels of gamma radiation than were involved in the other studies, and to supplement mechanical property measurements with measurements of changes in the solution and rheological properties of irradiated polyurethanes as gages of progress in attempts to synthesize polyurethanes of even greater radiation resistance.

A portion of the above-mentioned study is reported in this paper, which is primarily a description of the effect of moderate (to 100 megaroentgens)[4] and high (5,000 Mr) levels of gamma radiation on the mechanical, solution, and rheological properties of a solid, essentially linear polyurethane elastomer, Estane 5740 X 1.[5] The behavior of this polymer, when it is exposed to weathering conditions also is reviewed briefly in this paper.

The subject polymer of this study, Estane 5740 X 1, is a tough, strong, abrasion-, oil-, gasoline-, and ozone-resistant thermoplastic poly(ester-urethane) prepared from diphenylmethane-p,p′-diisocyanate, adipic acid, and butanediol-1,4 (3, 4). (See Figure 1, on the next page.)

Estane 5740 X 1 lends itself well to conventional rubber and plastics processing techniques including solution applications. It has a Shore A hardness index of about 85 and, although not covalently cross-linked, possesses the superficial properties of a strong rubbery vulcanizate. It has, therefore, been described as a "virtually cross-linked" elastomer (3).

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[1] Presented before the Division of Paint, Plastics & Printing Ink Chemistry, ACS, Cleveland, O., Apr. 7, 1960.

[2] Numbers in parentheses refer to bibliography references at end of article.

[3] Sponsor—Naval Ordnance, Bureau of Ships.

[4] One megaroentgen = 10^6 roentgens = 1 Mr, the abbreviation hereinafter used. The roentgen (r) is defined as that quantity of X- or γ radiation which, on passing through air at 0° C. and 760-mm. pressure, produces ions carrying one electrostatic unit of electricity of either sign, per cubic centimeter. One roentgen corresponds to the absorption of 0.109 erg per cubic centimeter of air or 83.8 ergs per gram of air.

[5] B. F. Goodrich Chemical Co., Cleveland, O.

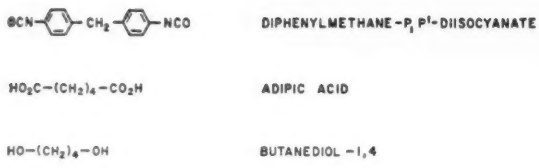

Fig. 1. Components of Estane 5740 X 1 polyurethane

Experimental Details

The irradiation techniques and test methods employed to obtain the data of this paper are described in this section.

The samples of this study were irradiated either at the Materials Testing Reactor (MTR) facility at Arco, Idaho, or in the B. F. Goodrich Co. Research Center cobalt 60 source (BFG) at Brecksville, O. A detailed description of the latter source has been published (5). During this study the BFG facility was rated at 1,000 curies. The output at the center hole was 90,000 roentgens per hour.

High-level exposures (5,000 Mr) and two series of lower-level exposures were performed at MTR. The samples were wrapped in aluminum foil and placed (in air) inside aluminum canisters of 2½-inch inside diameter, 3-inch outside diameter and 8⅜-inch height. The sealed canisters were then immersed in water for irradiation.

The bulk of the lower-level exposures (to 100 Mr) of samples was carried out at BFG in small glass vials or tubes allowing the samples access to either air (vial uncapped) or limited air (vial capped), or in a vacuum (tube exhaustively evacuated by pumping, then sealed).

Stress-strain[6] testing was done with the Scott[7] tensile tester, operated at a jaw separation rate of 20 inches per minute.

Compression set[6] was determined after 22 hours at 158° F. (ASTM[8] D 395-53T).

Tear resistance[6] was estimated by the Graves angle tear test (ASTM D 624-54).

Yerzley resilience[6] was determined according to ASTM procedure D 945-55.

Abrasion resistance[6] (Pico) was measured according to a patented method (6). In this test twin parallel tungsten carbide knife edges under a load of about 10 pounds rest on the flat surface of a molded disk-like test piece mounted on a turntable and rotated at about 60 rpm. as finely divided scouring material (e.g., silica) sifts continuously on to the contact area. After 80 rotations the weight loss of the sample is determined, converted to volume loss, and compared with that of a high-quality natural rubber-EPC black tire tread stock which is given an index value of 100. Abrasion resistance is expressed relative to this value.

Flex life[6] was determined using a plastics flexing device of proprietary design (7). This tester is similar in principle and operation to a tire cord fatigue tester described in an earlier publication (8). In the plastics tester a 25-mil thick sample strip, ¼-inch by 4½ inches is looped over two parallel, free-rolling steel pinions (⅛-inch diameter) which are ⅜-inch apart, and the sample ends are fastened together with a clamp that also bears a 1,000-gram weight. This weight is arranged to apply the load horizontally. The pinion assembly, attached to a rotating drum, is then set in rotary motion (60 rpm.), causing the loop to open and close alternately, flexing the sample at a rate of 120 times per minute. The test is run to 2,500 minutes or prior failure.

Intrinsic viscosity[9] was determined using the Ubbelohde suspended-level construction viscometer (9). Four concentrations in dimethyl formamide were run for each exposure level to obtain the intrinsic viscosity $[\eta]$. Bath temperature was maintained at 25° ±0.02° C.

Sol-gel[9] determinations were done by the method of Yanko (10). This method is insensitive to microgel.

Weight average molecular weight (M_w)[9] was determined using the Brice-Phoenix light scattering photometer.[10] Solutions of the irradiated polymer were passed through filters of 3750 ± 1250 Angstrom units pore diameter prior to their examination in the photometer.

Number average molecular weight (M_n)[9] was determined using a hybrid modification (11) of the Schultz and Zimm-Myerson type of osmometers. The measure of osmotic pressure was done by the static elevation method at a temperature of 25° ± 0.01° C. Solutions of the irradiated polymer samples were filtered through No. 576 Schleicher and Schuell analytical filter paper prior to their introduction into the osmometer.

Flow index[9] was determined at 510 psi. and 150° ± 0.5° C., using a constant-load rheometer of proprietary design (12). This instrument is a capillary type rheometer. The sample is extruded from a small chamber through a 0.085 of an inch orifice at any predetermined temperature (to 300° C.) and pressure (to 10,000 psi.). The extrudate is then sampled at convenience (usually after about 60 seconds) and is weighed. The flow rate is expressed as milligrams of sample extruding (under the predetermined, constant conditions of temperature and pressure) per minute. Extrudate quality is also noted.

T_1 and T_2 dynamic extrusion values[9] were estimated using a dynamic extrusion rheometer of proprietary design (12) In the operation of this instrument the (granular) polymer sample is placed into a chamber under a plunger comprising a load of 3263 lbs./in.^{2} The sample is gradually heated to effect its ultimate extrusion through a 0.0625-inch diameter orifice. Plunger advance and temperature increase are periodically and accurately measured. Their plot provides a curve whose interpretation enables the calculation of T_1 and T_2 values. The viscosity of polymers at T_2, as measured by the Olsen parallel plate plastometer (13), is between about 50×10^8 and 400×10^8 poises.

Elemental analyses[9] involved standard carbon and hydrogen determinations and the micro Kjeldahl method for nitrogen.

Mass spectrometer analyses[9] were performed with a Consolidated Electrodynamic Corp.[11] analytical mass spectrometer, model 21-103C. The samples were sealed in a Pyrex tube under a vacuum of 10^{-6} mm. Hg for irradiation.

Infrared absorption spectra were determined from film samples of polymer cast on water from tetrahydrofuran solution. The Perkin-Elmer[12] model 321 infrared spectrophotometer was the instrument used to measure the spectra.

Ultraviolet absorption spectra were determined on very thin films of polymer cast on water from tetrahydrofuran solution. The DK-2 Beckman ratio recording spectrophotometer[13] was the instrument used in this case to measure the spectra.

Accelerated weathering[6] of samples was accomplished using the Atlas Twin Lamp Type HVDL-X Weather-Ometer[14] without water spray and with continuous illumination (barring two hours per day for arc adjustment and globe cleaning).

Results and Discussion

Effects of Gamma Radiation on Stress-Strain Properties

Stress-strain measurements were used to help determine the extent of damage in gamma irradiated Estane 5740 X 1 samples. Table 1 shows the effects of such exposure on the tensile strength, 300% modulus, and elongation of the polymer. These data show good retention of all stress-strain properties in samples exposed to as much as 100 Mr, and a significant improvement in tensile strength, albeit appreciable loss

[6] The formed test piece was irradiated.
[7] Scott Testers, Inc., Providence, R. I.
[8] American Society for Testing Materials, Philadelphia, Pa.
[9] Small granules of the polymer were irradiated for this test.
[10] Phoenix Precision Instrument Co., Philadelphia, Pa.
[11] Consolidated Electrodynamic Corp., Pasadena, Calif.
[12] Perkin-Elmer Corp., Norwalk, Conn.
[13] Beckman Instruments, Inc., Fullerton, Calif.
[14] Atlas Electric Devices Co., Chicago, Ill.

TABLE 1. CHANGES IN ESTANE 5740 X 1 STRESS-STRAIN PROPERTIES ON GAMMA IRRADIATION IN LIMITED AIR (25-MIL-THICK MICRODUMBBELLS)

Exposure Level, Mr	Tensile Strength, psi.	Ultimate Elongation, %	300% Modulus, psi.
0	6000	600	1400
20	6300	520	1200
50	5700	530	1200
100	4520	475	1500
5000	8000	~25	—

TABLE 2. CHANGE IN ESTANE VC STRESS-STRAIN PROPERTIES ON GAMMA IRRADIATION IN AIR (HARRINGTON)

Exposure Level, Mr	Tensile Strength, psi.	Ultimate Elongation, %	Flexibility
0	6390	500	Good
300	2505	240	Good
500	2358	160	Good
1000	2295	90	Good

TABLE 3. CHANGES IN ESTANE 5740 X 1 MECHANICAL PROPERTIES ON EXPOSURE TO 500 MR OF GAMMA RADIATION IN LIMITED AIR

Property Measured	Unexposed Sample	Exposed Sample
Shore D hardness	40	82
Compression set, %	84	69
Tear resistance, lbs./0.1 in.	50	32
Yerzley resilience, % at 75° F.	78	Too hard to test
Brittle point, °C.	<-74	>25
Abrasion resistance index, Pico*	271	25
Behavior in tetrahydrofuran	Dissolved	Swelled
Flex life, cycles	465,312 (no break)	Too brittle to test

* With best-quality natural rubber tire tread stock as the standard of comparison at an index of 100.

of extensibility, in samples exposed to 5,000 Mr.

Harrington (2c) has determined and reported the effect of gamma irradiation in air on the stress-strain properties of Estane VC (Estane 5740 X 1) at exposure levels intermediate to those of this study. He likewise noted the high degree of gamma radiation resistance of this polymer, which is apparent in his data in Table 2.

Effects of Gamma Radiation on Other Mechanical Properties and Appearance

Lower-level gamma irradiation (to 100 Mr) of Estane 5740 X 1 in limited air tended to harden the samples somewhat and turn them red-brown in color, but did not detract from their flexibility to any apparent degree. Such degrees of exposure do not appear to rule out any of the usual dynamic or static applications of the polymer.

The higher-level gamma exposure (5,000 Mr) of the polymer in limited air, on the other hand, hardened and stiffened samples noticeably, causing them to change from a light amber to a brown color and producing a faint butyric odor. The specific changes measured in the polymer on such exposure are indicated in Table 3 and are of such a nature as to suggest useful static applications of the polymer, but likely only limited dynamic applications.

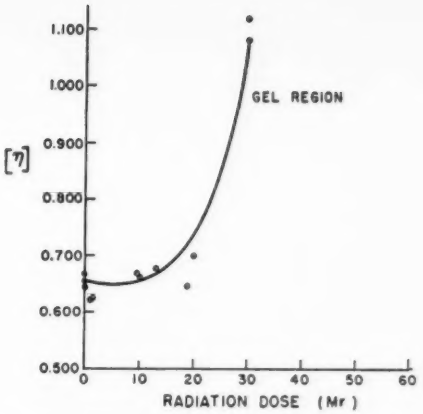

Fig. 2. The effect of gamma irradiation in air on the intrinsic viscosity of Estane 5740 X 1 in dimethyl formamide

Effect of Gamma Radiation on Solution Properties

In determining the effect of gamma radiation on the solution and rheological properties of Estane 5740 X 1, another polymer lot exhibiting the following mechanical properties was studied. This sample showed a tensile strength of 5,200 psi., an ultimate elongation of 720%, a 300% modulus of 110 psi., and a Shore A hardness of 83. It proved to have a number average molecular weight of 32,900 (osmometry, cyclopentanone) and a weight average molecular weight of 93,000 (light scattering, cyclopentanone). It was completely soluble in dimethyl formamide and in cyclopentanone.

AS INDICATED BY INTRINSIC VISCOSITY MEASUREMENTS. The intrinsic viscosities of irradiated samples of Estane 5740 X 1 in solution were determined and studied in order to detect chain scission effects (viscosity decrease) and early cross-linking tendencies (viscosity increase).

Figure 2 shows the effect of 1 to 50 Mr of gamma irradiation in air $[\eta]$ for this polymer. The value of $[\eta]$ for the irradiated polymer appears to go through a minimum at the lower doses. This result was initially interpreted as evidence of shortened polymer chains resulting from the predominance of a chain scission reaction; however, subsequent molecular weight determinations and rheological data force the conclusion that these samples are likely to exhibit lower viscosity due to their transformation into branched structures. Scission of the polymer chains probably preceded and led to the branched structures via the combination of the generated radical chains with other polymer chains.

TABLE 4. EFFECT OF GAMMA IRRADIATION IN AIR ON GEL CONTENT OF ESTANE 5740 X 1. DIMETHYL FORMAMIDE SOLVENT

Radiation Dose, Mr	Gel, Swollen Wgt. in Gms.	Gel, %
41.4	6.6	22.2
50	6.0	20.3
50	5.3	23.0
100	2.5	57.4

The results indicate that continued irradiation of the polymer leads to the covalently cross-linked state, and to the eventual gelation of the polymer.

AS INDICATED BY SOL-GEL STUDIES. As has been indicated, the gamma irradiation of Estane 5740 X 1 develops gel in the polymer. The degree of formation of such gel relative to the irradiation dose, and the amount of sol, are useful indications of the radiation resistance of the polymers. They allow the calculation of the cross-linking index (γ), the gel point dose (R_G), and the number of cross-links per weight average molecule produced by 100 electron volts, G(X).

Table 4 indicates the effect of three levels of gamma radiation in air on the gel content of Estane 5740 X 1.

In the course of this work it was discovered that microgel, too fine to be detected by our sol-gel technique, but isolable on ultrafine filters (3750 ± 1250 Angstrom units pore size) used to filter solutions for light scattering molecular weight determinations, is detectable in Estane 5740 X 1 after 7.13 Mr of irradiation.

Such microgel, unfilterable by the sol-gel technique employed and fine enough to flow in solvent through a viscometer, is present, but undetected in samples of Estane 5740 X 1 irradiated to as much as 30 Mr. This microgel has not been considered in the following calculations which are based on the present sol-gel studies.

The data of Table 4 provide the sol fraction (W_s) for each dose, which in turn allows the calculation of the cross-linking index (γ) according to the following equation (14):

$$\gamma = \frac{1 - (W_s)^{\frac{1}{2}}}{(W_s)^{\frac{1}{2}}(1 - W_s)}$$

When γ is plotted against radiation dose, and the curve is extrapolated to $\gamma = 0.5$, the gel point dose (R_G) is read from the curve where γ=0.5. The gel point dose represents the amount of gamma radiation required to produce insoluble polymer (in this case as detected and measured by our sol-gel determination technique) in the exposed sample, and according to Charlesby (15) represents the situation where there is, on the average, one cross-linked unit for every two primary number average molecules, or one cross-link for every four primary number average molecules.

When RG is known, G(X), the number of cross-links per weight average molecule produced by 100 electron volts can be determined according to the following equation (15):

TABLE 5. EFFECT OF GAMMA IRRADIATION IN AIR ON NUMBER AVERAGE AND WEIGHT AVERAGE MOLECULAR WEIGHTS OF ESTANE 5740 X 1. CYCLOPENTANONE SOLVENT

Radiation Dose, Mr	Molecular Weight of Sol Portion: Number Average, M_n	Weight Average, M_w	M_w/M_n	Microgel, %
0	32,900	93,300	2.8	0
1.14	39,100	122,200	3.1	0
2.47	31,200	175,000	5.6	0
7.13	34,100	147,000	4.3	1.0
13.03	38,400	249,000	6.5	2.0
18.97	28,500	283,000	9.9	14.8
23.35	30,600	—	—	17.5

$$G(X) = \frac{(0.5)(10^6)}{R_G M_w}$$

G(X) is a measure of radiation resistance; the lower its numerical value the more radiation-resistant the polymer. R_G proves to be 29.5 Mr, and G(X) is 0.21 for Estane 5740 X 1. G(X) is 0.04 for the notably gamma radiation-resistant plastic, polystyrene (16), but is 3.6 for the poorly radiation-resistant elastomer, polybutadiene (16). G(X) is in the range 1.1 to 1.7 for natural rubber (17).

AS INDICATED BY MOLECULAR WEIGHT STUDIES. An important change occurring during the gamma irradiation of some polymers is the increase in the average size of the polymer chains. Intrinsic viscosity and sol-gel studies indicate that this phenomenon occurs on the gamma irradiation of Estane 5740 X 1. Studies of the changes in its number average molecular weight (M_n) and weight average molecular weight (M_w) by osmometry and light scattering techniques, respectively, have supplied quantitative measures of the degree of such changes as well as indicating something of the structure of the larger new molecules and the molecular weight distribution in the irradiated sample.

Table 5 shows the effect of several levels of gamma irradiation in air on M_n and M_w on Estane 5740 X 1.

The data show that although microgel content, first detectable as at 7.13 Mr, increases steadily thereafter, the number average molecular weight of the sol portion remains fairly constant throughout the above range of exposures. On the other hand, the weight average molecular weight increases steadily to the exposure level 7.13 Mr where it shows a sharp decrease, presumably because of the development and removal of microgel from the sol. There is the disturbing possibility, however, that the ultra-fine filter employed to filter the solutions of irradiated samples may be removing essentially linear, high molecular weight fractions in addition to microgel.

The continued increase in values of M_w at subsequent higher exposure levels of 13.03 and 18.97 Mr in Table 5 would seem to indicate that although microgel is still formed, and in increasing amounts, the weight average molecular weight of the soluble portion of the polymer now increases by branching at a rate

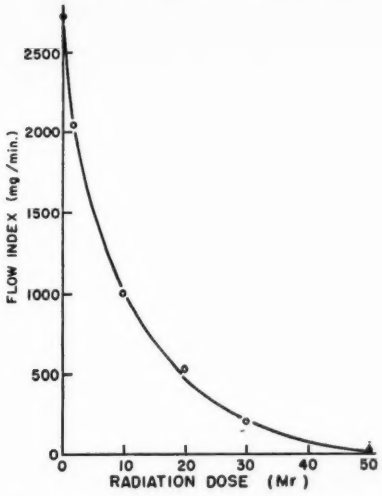

Fig. 3. Flow index values *vs.* radiation dose for Estane 5740 X 1. Constant-load rheometer used; conditions 510 psi., 150° C.

which more than compensates for the loss of high molecular (cross-linked) species as insoluble microgel.

The ratio M_w/M_n is an indication of the molecular weight distribution of a polymer. In Table 5 this value increases steadily with radiation dose (except for the 7.13 dose) and thus, according to the prevailing theory (18), indicates an increase of branching in the sol portion of Estane 5740 X 1 with increasing gamma irradiation. This change also can be interpreted as a broadening of the molecular weight distribution in the irradiated polymer.

Effect of Gamma Radiation on Rheological Properties

The rheological behavior of Estane 5740 X 1 was studied before and after gamma irradiation to detect changes in the flow properties of the polymer which would indicate chain scission and/or cross-linking effects. In polymer systems, cross-linking impedes viscous flow, increases the softening temperature, and increases elasticity to a degree. Chain scission reduces the yield stress for viscous flow, lowers the softening temperature, and decreases the elasticity.

Rheological properties were examined by using a constant-load rheometer and a dynamic extrusion rheometer. The former instrument maintained the sample under constant load as well as constant temperature conditions. The latter device maintained the sample at constant load while progressively raising its temperature.

As Indicated by the Constant-Load Rheometer. The flow index value obtained from the constant-load rheometer represents the weight of material in mgs./-min. extruding at 510 psi. and 150° ± 0.5° C. Changes in this value are believed to be indications of changes in polymer molecular structure such as branching, molecular weight, and cross-linking.

Figure 3 represents a plot of flow index values

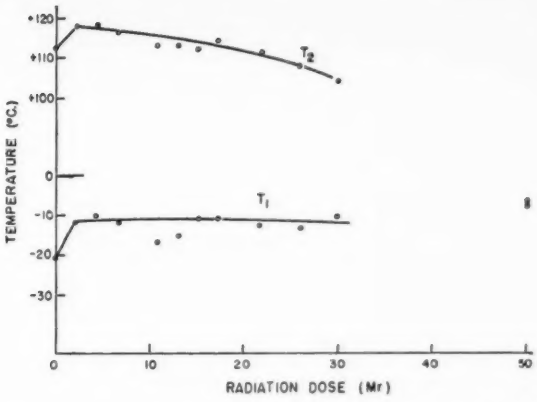

Fig. 4. Changes in rheological properties of Estane 5740 X 1 on gamma irradiation in air. Dynamic extrusion rheometer used

versus radiation dose for Estane 5740 X 1 irradiated in limited air. The flow index of the polymer is seen to decrease with increasing irradiation, which is the expected change where molecular size has increased with irradiation and is thus consistent with light scattering M_w determinations. Examination of the extrudates showed them to be smooth in the range 0 to about 10 Mr and rough beyond this point. The roughness is likely due to the buildup of effective amounts of microgel and finally gel, and/or to increase in M_w.

As Indicated by the Dynamic Extrusion Rheometer. T_1, roughly the second-order transition temperature, and T_2, the melt-flow temperature, of Estane 5740 X 1 were estimated with the dynamic extrusion rheometer (12). T_1 is sensitive to the stiffness of ploymer chains; whereas T_2 is believed to be sensitive to molecular weight changes, cross-linking, crystallization, and internal plasticization in polymers.

Figure 4 is a plot of T_1 and T_2 values of the polymer after several levels of gamma irradiation in air, *versus* radiation dose. All the values of T_1 for the irradiated samples are seen to be greater than that of the unexposed sample, indicating the chain stiffening effect of the irradiation. T_2 values are seen to increase initially, then to decrease, with increasing irradiaton.

The increase of T_2 at low doses and its subsequent decline with continued exposures of up to 30 Mr were not a wholly anticipated change in the gamma irradiation of Estane 5740 X 1. The declining portion of the curve might be due to the development of branched structures in the polymer (which are indicated by the increase of M_w/M_n ratios with increasing radiation doses), but the increase of T_2 at low doses is not explained.

The final plotted value of T_2 (at 50 Mr) is consistent with the gelation effect of the predominating reaction (cross-linking).

Effect of Gamma Radiation on Chemical Composition

Changes in the chemical composition of Estane 5740 X 1 on gamma irradiation were assessed by means of direct microanalyses, by mass spectrometry,

TABLE 6. CHANGES IN ELEMENTAL COMPOSITION OF ESTANE 5740 X 1 IN GAMMA IRRADIATION IN AIR AND IN VACUUM

Sample Environment	Radiation Dose, Mr	Composition			
		% C	% H	% N	% O
—	—	Calc'd 62.85	7.14	3.33	26.68
Air	0	Found 62.71	7.25	3.41	*26.63
Air	51.1	Found 62.47	7.09	3.33	*27.11
Vacuum (10^{-6} mm. Hg)	38.2	Found 62.23	7.14	3.50	*27.13

* By difference.

TABLE 7. MASS SPECTROMETER ANAYLSIS OF GASES EVOLVED* ON GAMMA IRRADIATION OF ESTANE 5740 X 1 IN VACUUM (10^{-6} MM. HG)

Components of Gaseous Phase	Mole % of Components Present in Gaseous Phase After Exposure		
	1.71 Mr	17.23 Mr	38.22 Mr
Carbon monoxide	20.1	23.3	26.2
Dioxide	19.9	30.8	29.5
Hydrogen	21.2	45.0	39.6
Nitrogen	19.3	3.6	2.68
Oxygen	3.8	<1.0	<1.0
Water	15.7	1.0	<1.0
Acetylene	—	—	0.8

* Amount: 1.03 x 10^{-5} moles/gm. Estane 5740 x 1 (17.23 Mr)

and by infrared and ultraviolet absorption spectrophotometry. Although microanalyses showed minor changes in elemental composition, absorption spectra suggested some structural changes, and mass spectrometry identified small amounts of evolved decomposition products generated on irradiation, the changes in chemical composition of this polymer are slight in exposures as great as 100 Mr.

AS INDICATED BY MICROANALYSES. Table 6 shows the slight changes in elemental composition attending the gamma irradiation of Estane 5740 X 1 in air and in vacuum.

AS INDICATED BY MASS SPECTROMETRY. The gamma irradiation of Estane 5740 X 1 at 25° C. in vacuum results in the evolution of small amounts of several gaseous decomposition products. The identities and amounts of volatile decomposition products resulting from three levels of exposure of the polymer at 10^{-6} mm. Hg pressure were determined with the mass spectrometer and are indicated in Table 7.

In the case of 17.23 Mr exposure it was determined by direct weighings that 0.02% of the sample volatilized during irradiation to provide the gas phase analyzed. This figure is in good agreement with the weight of evolved gases calculated from the mass spectrometer analysis.

The rates of carbon dioxide and hydrogen evolution are seen to increase considerably over that of carbon monoxide at the higher levels of irradiation;

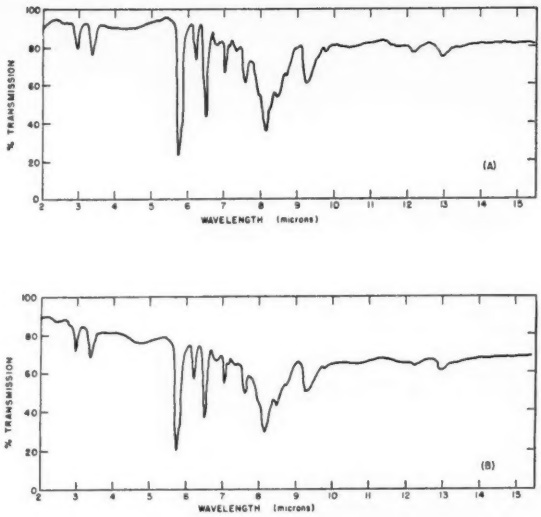

Fig. 5. The effect of gamma radiation on the infrared absorption spectrum of Estane 5740 X 1. (A) is unexposed film. (B) is same film after 100 Mr exposure in limited air

whereas nitrogen, oxygen, and water are tending to disappear as components of the gas phase. The appearance of acetylene in the gas phase after 38 Mr exposure indicates some deep-seated structural changes in the less labile portions of the polymer molecule.

AS INDICATED BY INFRARED ABSORPTION. Many materials have characteristic absorption spectra in the infrared region which are determined by the absorption of the individual functional groups and structures in the material. Changes in the chemical structure of such materials, whatever the cause, can frequently be detected and interpreted by a study of their infrared absorption spectra. This technique was applied to Estane 5740 X 1 to determine the degree and the nature of any changes in its chemical structure that result from gamma irradiation. Inspection of Figure 5 indicates that there is little change in the infrared absorption spectrum of the polymer after exposure of a one-mil thick film to 100 Mr of gamma radiation in limited air.

The major bands involving the —NH— and carbonyl groups and the benzine ring did not change significantly. The region 4.2 to 5.5 microns, which includes the wavelengths 4.7 to 4.8 that are assigned to the carbodiimide structure (—N=C—N—), does suggest the possibility of the presence of such a structure in the irradiated polymer. Carbodiimides can form from urethanes or isocyanates with the concurrent evolution of carbon dioxide (19), a product of gamma-irradiated Estane 5740 X 1 noted in the mass spectrometer analyses.

AS INDICATED BY ULTRAVIOLET ABSORPTION. Changes in the chemical structure of material absorbing in the ultraviolet region can likewise be detected and frequently interpreted by an examination of their ultraviolet absorption spectra. In the case of Estane 5740 X 1 distinct changes in the chemical composition

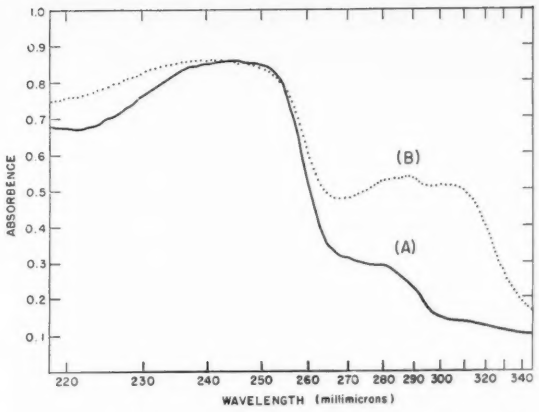

Fig. 6. The effect of gamma radiation on the ultraviolet absorption spectrum of Estane 5740 X 1. (A) is unexposed film. (B) is same film after 100 Mr exposure in limited air

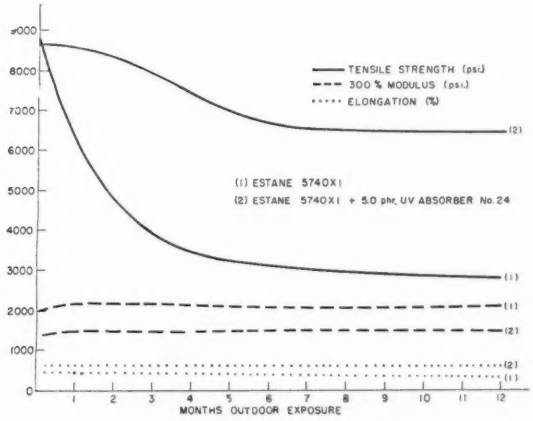
TENSILE STRENGTH (psi.)
300 % MODULUS (psi.)
ELONGATION (%)
(1) ESTANE 5740X1
(2) ESTANE 5740X1 + 5.0 phr. UV ABSORBER No. 24
MONTHS OUTDOOR EXPOSURE

Fig. 8. Changes in the stress-strain properties of Estane 5740 X 1, on outdoor exposure with and without 5 phr. of an ultraviolet absorber. Microdumbbells 25 mil thick used

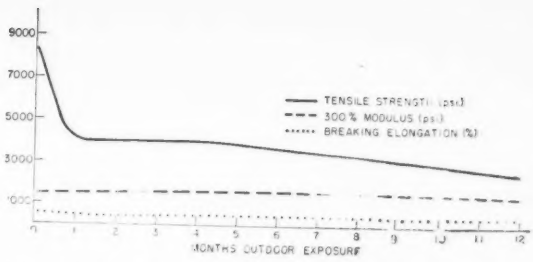

Fig. 7. The effect of outdoor weathering on Estane 5740 X 1 (1/8-inch dumbbells, 75 mil thick used)

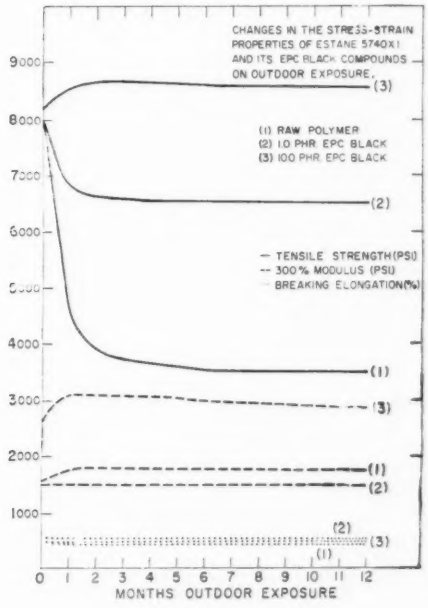
CHANGES IN THE STRESS-STRAIN PROPERTIES OF ESTANE 5740X1 AND ITS EPC BLACK COMPOUNDS ON OUTDOOR EXPOSURE.
(1) RAW POLYMER
(2) 1.0 PHR EPC BLACK
(3) 100 PHR EPC BLACK
TENSILE STRENGTH(PSI)
300% MODULUS (PSI)
BREAKING ELONGATION(%)
MONTHS OUTDOOR EXPOSURE

Fig. 9. Changes in stress-strain properties of Estane 5740 X 1 on outdoor exposure, with and without EPC carbon black

of an extremely thin film of the polymer after 100 Mr of gamma irradiation in air are apparent in Figure 6.

Figure 6 shows the irradiated polymer to develop an absorption peak in the 265 to 325 millimicron region. This peak is similar in position and nature to that which develops on the exposure of thin films of about 334 to 411 millimicrons. It was speculated (3, 20) that the ultraviolet-induced peak represents the development of a quinone-imide structure, which might also be the case here.

Effects of Weathering

As is the case with many useful linear polymers such as nylons (21, 22), polyethylene (23), etc., unprotected Estane 5740 X 1 undergoes some degradation on exposure to natural and artificial weather conditions. Figure 7 illustrates the change in stress-strain properties of 75-mil thick, 1/8-inch dumbbells of the unprotected polymer on 12 months of outdoor exposure at Brecksville, O.

The weathering of unprotected Estane 5740 X 1 is further characterized by the development of an insoluble and very flexible, but less extensible, skin on the exposed samples.

WeatherOmeter studies have shown the weathering of the polymer to be an ultraviolet-initiated autoxidation process sensitized by incident radiant solar energy within the wavelength range ca. 334 to 411 millimicrons (20). Certain compounds, which absorb strongly in this region such as the compatible UV Absorber No. 24,[15] are quite effective weather resisters. This fact is apparent in Figure 8, which shows the change in stress-strain properties of 25-mil-thick microdumbbell samples of the unprotected and protected polymer on 12 months of outdoor exposure at Brecksville, O.

[15] American Cyanamid Co., New York, N. Y.

The ultimate in weather-resistant compounds of Estane 5740 X 1 now known are those with carbon black. Figure 9 shows the change in the stress-strain properties of 25-mil-thick microdumbbells of this polymer containing 10 phr. of EPC carbon black on 12 months of outdoor exposure at Brecksville.

Summary and Conclusions

This paper demonstrates or calls to attention the following concerning the effects of two environmental conditions, gamma radiation and outdoor exposure, on a thermoplastic poly(ester-urethane) elastomer, Estane 5740 X 1:

This urethane elastomer exhibits outstanding resistance to deleterious change by gamma radiation and retains a high degree of strength, extensibility, and flexibility after exposures of up to 100 Mr in limited air. Exposures of 5,000 Mr strengthen and harden the polymer, but render it much less extensible and flexible. These irradiation levels extend each end of the exposure range employed in Harrington's study (2) of the radiation resistance of Estane 5740 X 1. His study also indicates the superior gamma radiation resistance of the polymer.

Extensive gamma irradiation vulcanizes Estane 5740 X 1. Lesser exposures produce detectable macromolecular changes which include the branching and some cross-linking of the polymer chains. Although there is no direct evidence of the shortening of the chains of this polymer on irradiation (chain scission), it is reasonable to suspect that this reaction occurs, then leads to branched and cross-linked states by combination of the radical chains.

Whereas measurable microgel was found in the polymer after 7.13 Mr of gamma irradiation, the calculated gel point does prove to be 29.5 Mr. The superior gamma radiation resistance of the polymer is consistent with its low G(X) cross-linking value, which is 0.21 in comparison with that of natural rubber (1.1 to 1.7), and polybutadiene (3.6).

The chemical changes in Estane 5740 X 1 attending its exposure to gamma radiation are slight. They include small changes in carbon, hydrogen, nitrogen, and oxygen content (to 51 Mr) due, at least in part, to losses of small amount of carbon monoxide, carbon dioxide, hydrogen, nitrogen, water, and (at 38 Mr) acetylene; slight changes in the infrared absorption spectrum of the polymer (after 100 Mr) including the development of a band suggesting the carbodiimide structure; changes in ultraviolet absorption spectrum of the polymer (after 100 Mr) suggestive of the development of a quinone-imide structure.

Good resistance to the degrading action of the ultraviolet radiation encountered in outdoor exposures is realized also in Estane 5740 X 1 by compounding the polymer with carbon black or certain ultraviolet absorbers. Outdoor exposure of the unprotected polymer results in some loss in mechanical strength and in the development of an insoluble, highly flexible, but less extensible skin on the exposed sample. In this respect this urethane polymer is similar to many other useful polymers such as nylon, polyethylene, etc., which are also susceptible to the weathering process unless protected by suitable additives. The process responsible for the weathering of Estane 5740 X 1 is an ultraviolet-initiated autoxidation which is sensitized by incident solar radiation within the wavelength range of 334 to 411 millimicrons.

Acknowledgment

The authors express their gratitude to the United States Naval Ordnance, Bureau of Ships, who sponsored the gamma radiation studies reported in this paper, and to E. Rowe, V. L. Folt, S. J. Caprette, and Miss M. J. Ferguson, of the B. F. Goodrich Co. Research Center, for performing mass spectrometer analyses and for aid in the interpretation of rheological data and absorption spectra.

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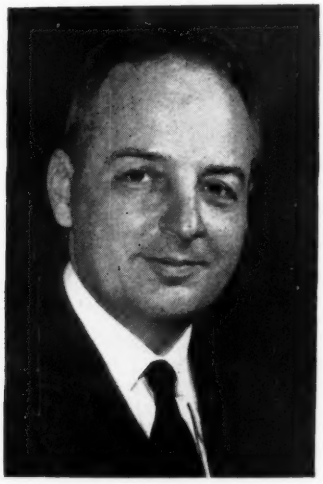
Marketing and Economic Outlook Discussed at RMA Subdivision Meeting



Arthur S. Flemming

The Molded, Extruded, Lathe Cut & Chemically Blown Sponge Products Subdivision of The Rubber Manufacturers Association, Inc., held its annual meeting at Skytop Lodge, Skytop, Pa., June 20-22, with about 100 members and guests in attendance. Howard W. Smith, president, Pawling Rubber Corp., and chairman of the Subdivision, opened the meeting with a special welcome to new members on the morning of June 20.

The business sessions included talks on sales and marketing, and a special feature was a talk by Arthur S. Flemming, Secretary of the Department of Health, Education & Welfare, who discussed the ramifications and administrative problems of the Food Additives Amendment of 1958 and answered specific questions of manufacturers supplying components to the food and beverage industries.

J. T. Cahoon, manager, market research department, Firestone Tire & Rubber Co., spoke on "The Economic Outlook for the Sixties." Fred A. Tough, assistant to the president, Ohio Rubber Co., explained "Better Use of Statistics in Market Planning," and there was a panel discussion moderated by E. W. Wright, director of sales, Johnson Rubber Co., on "How to Get More Out of Sales Meetings." Charles C. Miller, RMA public relations director, reported on the activities of the Association's public relations committee.

Prof. James R. Hawkinson, Northwestern University, presented a very interesting talk entitled "Planned Marketing for Profits in the Sixties."

The committee on arrangements was headed by E. Callanan, Clevite Harris Products, Inc., and Chairman Smith paid tribute to his work as well as that of the secretary of the Subdivision, Edward Welch, of the RMA staff. L. M. Johnson, Geauga Industries Co., was chairman of the golf tournament, and Mrs. David S. Watkins was chairwoman for the ladies' program. The social events included cocktail parties, a picnic steak broil, square dancing, and the annual banquet on the evening of June 21.

Fred A. Tough

Statistics and Market Planning

In discussing the "Better Use of Statistics in Market Planning," Mr. Tough pointed out that one of the most fundamental tools that can be used is the Standard Industrial Classification (SIC) system of the Federal Government. He said that the first step was to code customers and known prospects by four digit SIC numbers and suggested Dun & Bradstreet's "1960 Metalworking Directory Guide" and also its "Reference Book" as well as the market research services of *Steel*, *Iron Age*, and *Sales Management* magazines.

Ohio Rubber has used SIC for establishing sales territories, finding new markets for old products, finding markets for new products, for sales analysis and forecasting, and for finding out how the company compares with competition in any industry or any geographical area.

Boundaries for sales territories have been established by using internal company data along with Bureau of Census data based on SIC. County potentials were summed to form territories, and internal company data were then used to check out the areas defined.

In finding new markets for old products, each salesman has in notebook form the name and the address of the companies in his territory using rubber products, the SIC codes, number of workers, and a verbal description of what the prospect manufactures, together with the names of the general manager, production manager, chief engineer, and purchasing agent. IBM cards are used to tabulate and record the data.

The same IBM cards are used whenever a new product application comes along. The SIC who could use the product and the IBM equipment provide a listing of all prospects.

Changes in any one industry can be determined and used for planning purposes, and if a company's sales to an industry do not keep pace with the changes in that industry, remedial measures can be planned. Information tabulated by SIC allows a company to compare with competition for sales in any industry or in any geographic area.

SIC is now the accepted standard by which markets are defined and evaluated and provides the roadmap for long-term profits, it was said.

Sales Meeting Discussion

E. W. Wright, director of sales, Johnson Rubber Co., moderator for the panel discussion on "How To Get More Out of Sales Meetings," made the point that each of the companies in the RMA's Molded and Extruded Goods Subdivision has certain peculiarities due to size, type of solicitation, type of business, etc., that necessitate variations in its sales meeting programs. He provided a basic sales meeting plan for examination and comment by those present.

In this basic sales meeting plan, the objective and proper preparation were emphasized first; September or October was suggested as the best time for annual sales meetings; and it was indicated that only those involved in sales and salesmen should be in attendance, with other participants present only at such time as they were on the program. General information on the business outlook should be as brief as possible, but facts regarding the company's policy and plans for expansion, new product development, etc., should be explained in detail, it was advised. Each salesman should be given an opportunity to present problems of general nature from his territory, but individual personal problems should not be discussed. Mr. Wright cautioned against covering too many product lines at one meeting. The meeting should conclude with a cocktail dinner party and a short talk by a top-level officer of the company.

Mathew J. Katis, vice president and general manager, Dryden Rubber Division, Sheller Mfg. Corp., stressed the importance of the chairman's job in getting the most out of the sales meeting. He pointed out also the fact that the opening statement should be brief, but should sell those present on the importance of the subjects to be discussed.

This speaker said the opportunity for each salesman to report his problems and find out the opinions of other salesmen was good for morale and provided the means for developing new ideas. He suggested that after all those in attendance had been heard from, a certain pattern or trend develops in each product line, and it is on this basis that the meeting continues.

Mr. Katis said that by means of a written résumé of the meeting mailed to each salesman and other participants, a guide or reference during the interim period is provided and available for review at the next meeting. All the items on the report are dated and are removed when a decision regarding the proper action has been taken.

Floyd C. Melby, manager of the engineered products department, Goodyear Tire & Rubber Co., first emphasized that the best way to get more out of sales meetings was to put more into them. He pointed out also that there is every indication the decade ahead will be the "Changing Sixties" in population, new products, etc., and that if the period is one of change, it is also one of promise.

As a skillfully planned medium for successfully promoting sales, the objective and goal of the sales meeting should be outlined, place and procedure should be planned down to the last detail, something positive and constructive in the form of new products or new prices should be available, the need of maximum effort underscored, and the rewards for success emphasized, Mr. Melby declared.

Harry C. Dinmore, sales manager of industrial products, Tyer Rubber Co., reported that annual sales meeting of his company usually included group education lectures, round table discussions, "gripe" sessions, social hours, factory visits, and personal discussions.

The group education lectures are more productive if the subjects covered are made available for study in advance to the salesmen attending the meeting, it was said. Subjects for panel discussions should be obtained from talks in advance with individual salesmen and the panels made of those most interested in specific items. At the time of these personal discussions, means by which the home office people can help the salesman with each customer should be a primary aim, while an analysis of each territory and a search for new ideas, new approaches, and new prospects are of equal importance. Factory visits were said to be of greatest value when some new process, new idea, or special people could be seen and/or explained. The main value of the social hours was said to be the opportunity to have the salesmen meet the home office sales and production people.

Economic Outlook for the Sixties

In discussing "The Economic Outlook for the Sixties", Mr. Cahoon reviewed first 1960 itself, that is, as far as we have gone. Sales of new automobiles were not up to expectations for the first quarter, but he estimated that production for the year at about 6,550,000 units would be 17% over 1959 output, the third best year in history. Truck production will be at its highest level in about 10 years, he predicted.

Employment is at an all-time high, disposable personal income is at its highest level ever, farm income is better than expected, and new plant and equipment expenditures are higher than ever before, with the possible exception of 1957.

Gross National Product increased in the first quarter of 1960 to a $500-billion annual rate and should turn out to be $510 billion for the year. Housing starts are down, but should be no worse than in 1959. Recent surveys show consumer buying intentions to be running ahead of a year ago.

Mr. Cahoon felt that the plateau we have currently reached will continue with very little change for the rest of the year and into the first half of 1961.

For the Sixties the most important factor will be the 40 million more people in the market place. The total population of 220 million people in this country in 1970 will have more people in the below 18 and over 65 years of age groups than in the Fifties, and there will be continued geographical shifts in the population. The move to suburbia will be greatly accelerated; while the West and parts of the South will continue to enjoy greater growth than the rest of the country.

Before the Sixties are over the GNP will have reached $750 billion by virtue of more people, more jobs, more output per manhour, and gradually rising prices. More automation, better equipment, more advanced management tech-

James R. Hawkinson

J. T. Cahoon

niques, and near-full employment will increase real income to consume this enlarged output.

With special reference to the molded, extruded, lathe-cut, and chemically blown sponge rubber products industry, Mr. Cahoon predicted that shipments should increase by 64% by 1970, and that even by 1965, these shipments, on a 1959 dollar basis, should be $261 million, or 35% ahead of the 1959 figure. In 1970 shipments should amount to $318 million, compared with $194 million in 1959, assuming prices remained constant. Since prices will advance, industry dollar value of shipments will be even higher in the Sixties.

In the short term, shipments of molded goods are running 8% ahead of shipments for the first quarter of 1959, extruded and lathe-cut goods 18% ahead; and chemically blown sponge 21% ahead.

Since almost one-third of the shipments of this industry go to the automotive industry, the expected 6.5 million cars to be produced this year should mean increased shipments of automotive rubber products over 1959 shipments. Automobile production for 1961 was estimated at 6.1 million units, rising to 7 million in 1965 and about 8 million in 1970. Truck production will reach record levels in the Sixties, it was added.

Non-automotive markets for molded and extruded goods are in a wide range of industries, all of which have excellent growth possibilities, Mr. Cahoon said. The picture looks very good, but the speaker cautioned that competition will continue to become stiffer in the Sixties, both from other rubber goods producers and from substitute materials. There will be great pressure to lower costs, and there is a threat of increased price instability so that it will be vital to find new uses for rubber materials and to make certain that the industry continues to get its share of present uses.

Although the Sixties will be a decade of prosperity, it will have its reverses, its share of those who fall by the wayside, but for those who move now to meet its challenges with well-thought-out plans based on sound forecasts and market appraisals, the green years lie just ahead, Mr. Cahoon said in conclusion.

Groups Hold Outings

Chicago Golf Tourney

Approximately 285 members and guests attended the annual golf outing of the Chicago Rubber Group, July 22, at St. Andrews Country Club, and 450 persons attended the dinner which followed.

Winners of first prizes in the golf competition were: low gross, members, Don Zimmerman, United States Rubber Co.; low gross, guests, J. Wernersback; nearest to pin, members, Frank Traver, Waukashau Rubber Co., and R. A. Short, Enjay Co.; nearest to pin, guests, Jim Ritz, Emery Industries, Inc., and William Gottlieb, Servus Rubber Co.; high gross, members, Gene Scanlon, Chicago Rawhide Mfg. Co.

Harold Stark, Dryden Rubber Division, Sheller Mfg. Co., was chairman of the outing committee, and Yale Karmell, Samuel Bingham's Sons, Mfg. Co., was assistant chairman. Other committee members were: Frank E. Smith, Williams-Bowman Rubber Co.; Edward Wagner, Phil Parratore, H. Russ Spielman, all of Witco Chemical Co.; Bill H. Lussie, R. T. Vanderbilt Co.; Al Marr, Judsen Rubber Works; Ted Biell and Edward Gentry, both of Dryden Rubber; Hy Crosland and Harold Shetler, both of Sirvene Division, Chicago Rawhide; and B. G. Hutchison, Copolymer Rubber & Chemical Corp.

NYRG Golf Tournament

There were 260 members and guests who played in the golf tourney of the New York Rubber Group, held at the Forsgate Country Club, Jamesburg, N. J., August 2. Total attendance was somewhat greater and included those who came for the dinner and other activities.

The winner of the Nesbit Cup for low gross for members was Wes Curtis, Naugatuck Chemical Division, United States Rubber Co., with a 73. R. Stimets, United Carbon Co., and A. H. Woodward, Du Pont, tied for second with an 80; and W. Weber, Glidden Co., was third with an 82. The low gross for non-members was won by A. Leffler with a 75; L. Laibe was second with a 77, and C. Basilone turned in a 78.

S. Linderman, Glidden Co., had the longest drive, 260 yards, with Wes Curtis second with a drive of 248 yards, and Ray Dudley, Whitney Blake Co., third with a 228-yard drive. Bob Emmett, Columbian Carbon Co., won the first prize for closest to the pin, with B. Topcik, Eberhard Faber Rubber Division, second.

The highest score was achieved by N. S. Beekley, Goodyear Tire & Rubber Co. Of special note was the hole-in-one scored by J. L. Been, Rubber & Asbestos Corp., on the seventh hole.

In the putting contest there was a tie for first honors between A. Leffler and R. P. Rossman, of Godfrey L. Cabot, Inc.

A fine roast-beef dinner was served under a tent on the front lawn of the Club, after which the many golf prizes and a large number of door prizes were distributed. W. R. Hartman, Laurie Rubber Reclaiming Co., vice chairman of the golf committee, handled the distribution of the prizes, with the help of other members of this committee, K. E. Chester, C. P. Hall Co.; Thomas Farley, R. T. Vanderbilt Co.; G. Rudeau, Whittaker, Clark & Daniels, Inc.; and P. Fullam, Du Pont. D. H. McCondichie, Merck & Co., golf committee chairman, could not be present because of his absence from the country.

E. S. Kern, R. T. Vanderbilt Co., Group chairman, thanked the golf committee for its work in making the tournament and outing such a success and mentioned that next year an effort will be made to secure an additional 18-hole course so that the waiting time may be reduced.

Tlargi July Outing

Fifty-three members and guests attended a golf outing of The Los Angeles Rubber Group, Inc., at the Yorba Linda Ranch & Country Club on July 27. Bob Bowen won the low gross; Guy Nolan, the low net; Don Simmons, the hole-in-one prize; Lefty Ferguson, the long drive; and Walt Holmes, the long putt.

Rubber Hall of Fame

A seventh member will be added to the University of Akron's International Rubber Science Hall of Fame at the annual symposium and banquet, November 18, at the University. Program plans call for an afternoon symposium and presentation of professional papers, followed by the evening banquet and award ceremony.

Selection of the 1960 member is being handled by a committee headed by Maurice Morton, AU professor of polymer chemistry and director of the Institute of Rubber Research.

Present members of the Hall of Fame are Charles Goodyear, American; Thomas Hancock and C. Greville Williams, English; Carl O. Weber, German; Henri Bouasse, French, and Ivan I. Ostromislensky, Russian.

L. A. Group Sponsors Fall Rubber Courses

The Tlargi Rubber Technology Foundation, sponsored by The Los Angeles Rubber Group, Inc., and the University of Southern California, will sponsor four courses in rubber technology during the University's fall semester. The courses include a practical basic course for salesmen, foremen and supervisors, purchasing agents, etc., and three advanced courses in the chemistry, production, testing, compounding and processing of natural and synthetic rubber and latices. Trips to laboratories and plants will supplement lectures.

Committee D-24, ASTM, Meets, Adopts Standards, Proposes New Tentative

The meeting of ASTM Committee D-24 on Carbon Black, held in Atlantic City on June 28 continued to show evidence of the great amount of work and accomplishment of this relatively new and small committee. Seven tentative specifications were advanced to Standard, one tentative was withdrawn, and one new tentative specification was approved by letter-ballot reported to the meeting.

One feature of the meeting of the main committee was the election of officers. N. P. Bekema, United States Rubber Co., was reelected chairman; J. F. Svetlik, Phillips Chemical Co., vice chairman; and T. D. Bolt, Godfrey L. Cabot, secretary. The advisory Committee elected consists of: R. F. Jones, Firestone; I. Drogin, United Carbon; L. G. Mason, B. F. Goodrich; C. A. Carlton, J. M. Huber; K. A. Burgess, Columbian Carbon; and R. B. Knill, Goodyear.

Subcommittee Meetings

The day's activities consisted of meetings of those subcommittees which desired to meet, followed by the meeting of the main committee in consecutive order during morning and afternoon sessions. Reports of the meetings are as follows:

Subcommittee 1—Physical Tests. J. F. Svetlik, chairman. The one negative vote on recommending D 1508-57T, Method of Test for Fines Content of Pelleted Carbon Black (Tentative), as a Standard was resolved by agreeing that an editorial change would be made. Section 3(e) should be changed to read, "Allow the sieve assembly to shake for the specified time with the hammer operating."

In a discussion on the test for Mass Strength of Pelleted Carbon Black, J. Salter, Western Electric Co. presented some very interesting data to show the effect on the test results when the dust is removed from the black. The subcommittee decided that the matter of screening dust out of the black was beyond its scope, and that the subcommittee's principal responsibility was to define a test method.

John Smith, J. M. Huber Corp., offered data to illustrate the reproducibility attainable with the test equipment for this mass strength test when a hydraulic means of applying compressive force is utilized and when a cylinder with an 8-micron finish is used. A tentative test method will be written defining the hydraulically operated equipment which will include a sketch, the description of the 8-micron-finish stainless-steel cylinder, and including tolerances, dimensions, rate of loading, method of calibration, and other pertinent details of the test. This procedure will also include a note that the reproducibility is judged to be about ± 5 pounds in this test. Copies of the procedure will be furnished to all consumers and suppliers, and the method will be letter-balloted after the meeting in February.

Subcommittee 2—Chemical Tests. L. G. Mason, chairman. Results of the letter-ballot were announced. Since there were no negative votes, D 1619-58T, Methods of Test for Sulfur Content of Carbon Black (Tentative), and D 1620-58T, Method of Test for Volatile Content of Carbon Black (Tentative), were recommended for adoption as Standards.

D 1510-57T, Method of Test for Iodine Adsorption Number of Carbon Black (Tentative), was also recommended for adoption as Standard after the Columbian Carbon negative vote was withdrawn. Columbian Carbon had suggested that a footnote be included stating that standardization was optional, and solutions could be checked by the value of the blank titration. The subcommittee felt that this would weaken the test and cause confusion, and that this could be left for the individual company to do if it desired without making it a part of the test. It was pointed out that modifications often are made by laboratories for their own use, but that the official version should be a complete referee method.

Subcommittee 3 — Optical Tests. John E. Smith, J. M. Huber, chairman. Action on D 1618-58T, Method of Test for Discoloration of Benzene by Carbon Black (Tentative), was again postponed until results of work being done in Subcommittee 15 of Committee D-11 on rubber are known. A. E. Hicks, Cities Service Research & Development, who serves as chairman of the task group under both subcommittees, reported on progress to date. The task group is attempting to set up a method for measuring staining tendencies of carbon black from tire carcass compounds through white sidewalls (migration stain) and also to set up rubber standards to be used for the measurement of the degree of stain by reflectance measurements. A detailed report is expected soon and will be mailed to the members of both committees.

Ten laboratories have submitted data covering different optical instruments. Preliminary studies indicate adequate sensitivity of color difference detection and reasonable agreement of data obtained on different types of instruments in several laboratories.

Subcommittee 4 — Nomenclature of Carbon Blacks. J. H. Gifford, Witco Chemical Co., chairman. The recent introduction of carbon blacks which do not lend themselves to present nomenclature has called attention to the inadequacy of the present system. R. A. Emmett, Columbian Carbon, was appointed chairman of a task group to investigate a system of renaming carbon blacks. A system based upon significant physical properties rather than action in rubber was suggested as being desirable.

Subcommittee 5—Sampling. R. O. Treat, Huber, chairman. A report was presented by the task group on sampling of hopper cars with data from both consumers and suppliers. Producers took samples at the following locations: the stream during loading, sample ports after loading, and samples from top of cars. The consumers sampled the top of cars, sample ports, and the stream during unloading. The data will be submitted to statisticians at Goodrich and Phillips to determine the most representative location to obtain samples. A procedure for sampling hopper cars of carbon black will be written based upon the recommendations of the statisticians' reports.

Subcommittee 7 — Specification for Carbon Blacks. J. H. Gifford, chairman. The letter-ballot on the proposed Tentative Method for Carbon Blacks Used in Rubber produced 27 affirmative votes, 3 negative votes, and 5 not voting. Two of the negative votes were registered to protest the lack of an SBR recipe in the all-natural rubber method. These were withdrawn when it was pointed out that SBR recipes were being considered in Subcommittee 29 of D-11 for synthetic polymer producers. The third negative vote stated that the method of sampling must be specified for the fines specification for bulk shipments. The subcommittee voted against the removal of the fines specification, with six voting for removal and seven against removal of the section. The subcommittee then voted to specify that the sample for fines should be taken from the sample ports. There was one negative vote on this ballot.

The subcommittee then voted unanimously to make the following editorial changes: a. Change Table I to specify a 5-minute fines test. b. Change section 8(a) to read: "Any material which fails in one or more of these test requirements shall be retested. For this purpose, two new random samples shall be tested for the requirement in which failure occurred. Failure of either of the retests shall be cause for final rejection." c. Add sentence to Section 3(b) to read: "Reference black and test black compounds shall

be prepared and tested at approximately the same time." d. Change Section I to read: "These specifications cover carbon blacks for ultimate use in rubber products and include both tests for the properties of blacks when incorporated in rubber, and certain properties of the blacks themselves as received by the consumer."

Tests to show better differentiation between SRF-LM and SRF-HM were reported. Two procedures can be used. (1) 400% modulus shows somewhat better differentiation than 300% modulus in proposed D-1522-58T, Methods for Testing Carbon Blacks in Rubber (Tentative), natural rubber recipe. (2) SBR 1000-type recipe with 120 parts of black showed a high degree of differentiation between these two blacks. The subcommittee agreed to refer this work to the task group set up to establish a synthetic rubber control recipe for carbon blacks.

Reports were made on heat loss relative to both bulk and bag shipments, but no satisfactory heat loss specification could be established at this meeting.

D-24 Session

Committee D-24 met to hear the above reports and to conduct committee business with 34 members and guests present. The chairman commented on the progress that was resulting from the aggressive, cooperative effort being made by the producers and the consumers to establish practical standard testing procedures for carbon black.

The group was urged to use statistical methods in the design of task-group work. The chairman appointed J. I. Black, Shell Chemical, to serve as a statistical consultant to the groups in planning test programs as well as analyzing the results.

The committee voted to recommend to ASTM the adoption of Methods of Test for Carbon Blacks Used in Rubber Products as a Tentative Method, with the changes as voted in subcommittee 8. Also recommended was the adoption of the following Tentatives as Standard without revision: D 1513-57T, Method of Test for Pour Density of Pelleted Carbon Black; D 1514-57T, Method of Test for Sieve Residue from Carbon Black; D 1619-58T, Methods of Test for Sulfur Content of Carbon Black; and with revision: D 1508-57T, Method of Test for Fines Content of Pelleted Carbon Black; D 1510-57T, Method of Test for Iodine Adsorption Number of Carbon Black; D 1511-57T, Method of Test for Pellet Size Distribution of Carbon Black; and D 1620-58T, Method of Test for Volatile Content of Carbon Black. D 1507-57T, Method of Test for Attrition of Pelleted Carbon Black, was recommended for withdrawal as being no longer required.

Committee D-11 Assigns Two New SBR Numbers

Committee D-11 on Rubber and Rubber-Like Materials of the American Society for Testing Materials, through Subcommittee 13 on Synthetic Elastomers, has assigned new numbers to two new black masterbatches, SBR 1816 and 1817, both requested by The General Tire & Rubber Co.

DESCRIPTION OF TYPES OF STYRENE-BUTADIENE (SBR) ELASTOMERS, ASSIGNMENT OF NEW CODE NUMBERS—ASTM D-11 1419-56T

Number as assigned	1816	1817
Date assigned	8/15/60	8/15/60
Distinctive feature	Dispersant-free ISAF-oil masterbatch	Dispersant-free SAF black-oil masterbatch
Close previous number, if any	Gentro-Jet 9250	Gentro-Jet 9252
Type	1800	1800
Nominal temp., °F.	41	41
Activator	FRA	FRA
Shortstop	ND	ND
Antioxidant	ST	ST
Catalyst	OHP	OHP
Emulsifier	Mixed	Mixed
Nominal bound styrene, %	23.5	23.5
Conversion, %	60	60
Mooney viscosity, ML 1+4 (212° F.)—compound	55	50
Coagulation	Acid	Acid
Carbon black type	ISAF	SAF
Phr.	70	55
Oil type	HI-AR	HI-AR
Phr.	45	45
Finishing	Normal	Normal

Note: Abbreviations and symbols are defined as follows:
FRA = free radical type, i.e., iron-pyrophosphate, peroxamine sulfoxylate.
HI-AR = highly aromatic.
ISAF = intermediate super abrasion furnace.
OHP = organic hydroperoxide.
ND = non-discoloring.
SAF = super abrasion furnace.
ST = staining.

NCRG Sessions

The Northern California Rubber Group completed its 1959-1960 program with a technical meeting on May 12 and a golf outing, June 17. The May meeting was held at the Elk's Club, Berkeley, Calif., with the featured after-dinner speaker being James V. Fusco, Enjay Chemical Co., who discussed "The Chemistry and Properties of Chlorinated Butyl."[1]

Mr. Fusco described for this audience some of the features of this modified butyl polymer which make it very desirable for many applications. He included a brief summary of the chlorination step, the fact that it shifts the double bond, and adds a chlorine to the allylic carbon of the double bond. The inherent activity of this allylic chlorine makes possible a large number of cross-linking systems. He also described some of the cure systems used and some of the major properties of the resulting vulcanizates which make the material useful.

The outing was held at the Green Hills Country Club, Millbrae, Calif., with golf during the afternoon and dinner in the evening. Low gross winner was A. Federico, C. P. Hall; low net went to Karl Johnson, H. K. Porter; closest to pin on 7th was Joe Mattson, Witco Chemical; and the longest drive on the 18th was registered by Victor Carriere, Mansfield Tire & Rubber.

[1] RUBBER WORLD, Apr., 1960, p. 112.

SRG Placement Service

The Southern Rubber Group has organized a placement committee to provide a clearing house for bringing experienced persons seeking employment in the rubber industry to employers seeking to fill jobs. Only applicants who are unemployed or about to be unemployed will qualify for services of the committee, but the committee will not assume any responsibility for finding positions for applicants.

Application forms for persons seeking employment may be obtained from Grady Oaks, Southeastern Rubber Mfg. Co., Athens, Ga., or John Wheelan, International Shoe Co., Bryan, Tex.

SORG Lecture Series

The Southern Ohio Rubber Group is sponsoring a lecture series, "Introduction to the Technology of Elastomeric Materials" at Sinclair College, Dayton, O. Members of the Southern Ohio Rubber Group will be lecturers.

The course will start late in September and run 16 weeks. Two hours of college credit will be given.

Moscow Conference

The Moscow Polymer Conference, held June 14-18, drew scientists from 20 countries, mostly European, but also including Australia, Canada, Israel, Japan, Malaya and the United States. Meetings were arranged under three sections: I. Synthesis of Polymers; II. Polymerization and Polycondensation Processes; III. Chemical Transformation in Polymer Chains. A total of 185 papers was submitted, more than half of them from Russia and satellite countries. The size of United States participation is especially worth noting; American experts presented 21 papers—only one less than offered by Czechoslovakia, which ranked second after Russia in this respect.

washington report

By JOHN F. KING

Government Withdraws Suit Against Goodrich on Cis-Polyisoprene Patent

A Federal District Court on August 24 issued a consent decree under which the government withdraws its suit against The B. F. Goodrich Co. in a three-year legal battle over patent rights to the Goodrich-developed Ameripol SN "synthetic natural" rubber. Goodrich promptly offered to negotiate licensing agreements with manufacturers in the United States and Canada to produce the synthetic under the Goodrich patent. Goodrich-Gulf Chemicals, Inc., a jointly owned Goodrich-Gulf Oil Corp. firm, will work out the licensing arrangements.

The consent decree by which the government vacated its suit was handed down by Federal District Judge Joseph C. McGarraghy. The decree gives Goodrich exclusive patent rights to the Ameripol SN process which was challenged in the government suit. The government claimed the process was developed under a government research contract by Goodrich and therefore was in the public domain. Goodrich argued successfully that the process was developed outside the government program, with Goodrich resources, at its Brecksville, O., research center.

Following the court decree, J. W. Keener, Goodrich president, issued a statement saying Ameripol SN was the exact duplicate of tree rubber and would make the industry independent of foreign natural rubber.

"This major discovery, sought by scientists here and abroad for generations, represents more than a notable scientific achievement. It takes on added significance in terms of national security since it could, in an emergency, make us independent of tree-grown rubber requirements," he declared.

Mr. Keener went on, "Natural, or tree rubber, is the preferred material for certain classes of products although nearly 66% of all the new rubber consumed in the United States last year was man-made.

"Until Ameripol-SN, the synthetic duplicate of tree rubber, was discovered every pound of natural rubber had to be imported from the Far East and Africa.

"Five years ago B. F. Goodrich announced that large truck tires made entirely from the new synthetic-natural rubber had been highway tested, giving mileage and service comparable with similar tires made of tree rubber.

"Truck tires were chosen for the test program for, with airplane tires, they were then the most important tire products still requiring natural rubber.

"In 1956, U. S. Army Ordnance reported that military truck tires made entirely of the new rubber proved superior to standard truck tires in military operations. The tires met or passed all military requirements and proved superior to standard tires tested at the same time under the same conditions.

"This new rubber not only adds another important strategic material to our resources for national defense, but will assure improved tires and other products which before could only be made with tree rubber grown on opposite sides of the world."

In a statement made later, Lucien O. Crockett, president of Goodrich-Gulf, reaffirmed the remarks made by Mr. Keener and spelled out in greater detail plans for the granting of licenses under these patents. Mr. Crockett said that information would be made available to licensees on the original patents acquired by GG from Karl Ziegler as well as patent rights and research and development information on Goodrich work since the government contracts were terminated in 1955.

According to Crockett, the non-exclusive licenses will be offered to any interested manufacturer with terms consisting of an initial cash payment, a further cash payment on establishment of a producing plant, and royalties of 2½% of the net sales price of synthetic natural rubber manufactured in the United States. In commenting on these terms, Mr. Crockett said that these royalties are modest and are designed to encourage broad participation in the manufacture of this product and also to reduce the dependence of the United States on tree rubber.

World Upheavals' Effect On the Rubber Industry

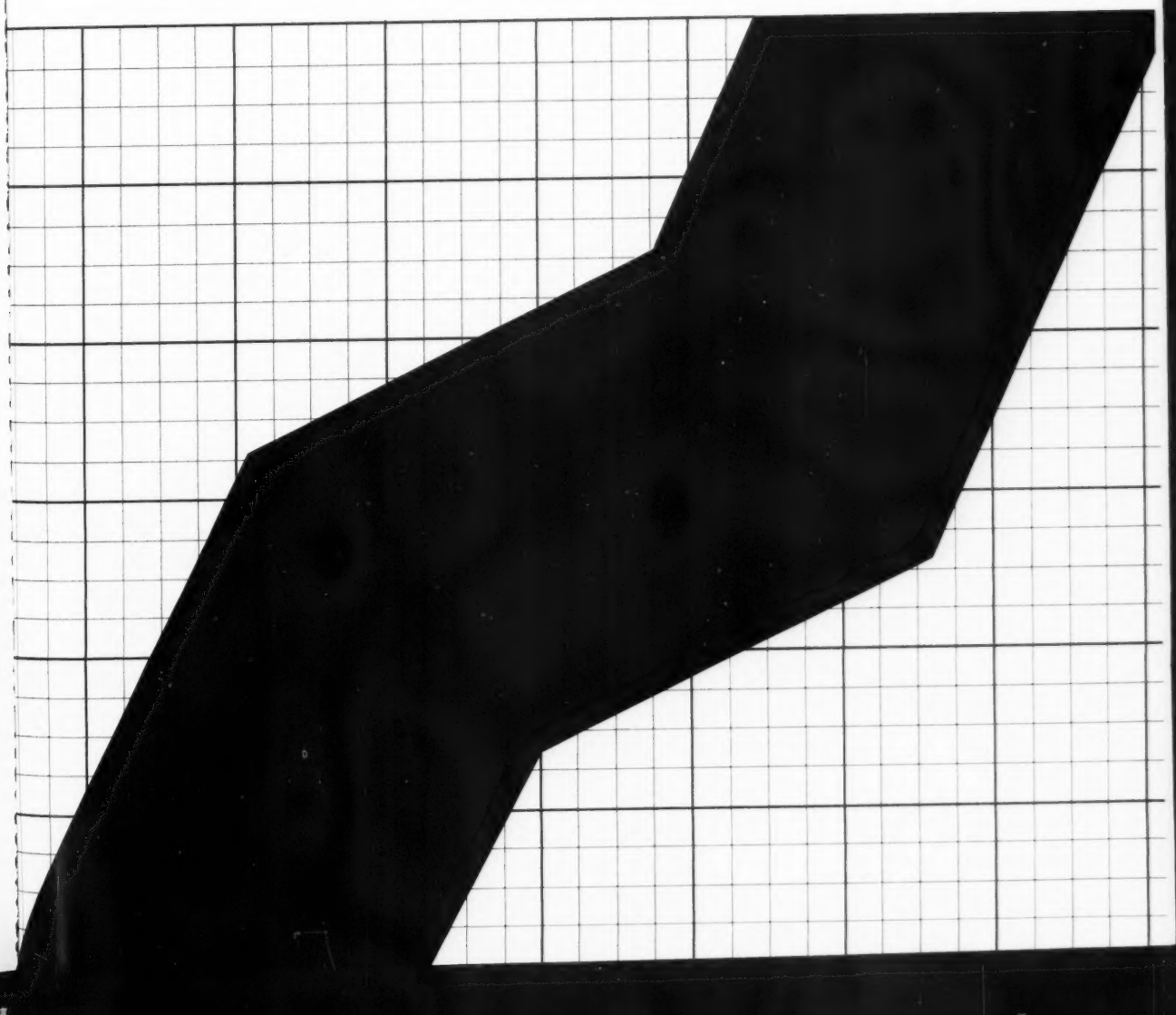
Three leading American rubber companies are lying low, hoping Fidel Castro won't notice them or their plants in Cuba, following in the wake of wholesale seizures of United States-owned property on the island.

Meantime, the mid-summer blowup in what is euphemistically called the Congo Republic threatens to have at least a mild impact on the international rubber industry. In late August the word from the Congo was that the mass exodus of European plantation managers means the total loss of Congo's anticipated $20-million rubber crop from this year's tapping.

In Cuba, the American rubber companies have considerable to lose should Castro resume his property confiscation which in July saw the Revolutionary Government take over the major portion of $1 billion in American-owned oil and mining operations, sugar mills, and power plants. Exactly what the companies have at stake in Cuba is not readily available here, and spokesmen for the companies are understandably reluctant to talk about their Cuban holdings lest "we call attention to ourselves."

Ameripol Micro-Black sales climb more than 1400% in just 18 months

Here's why...



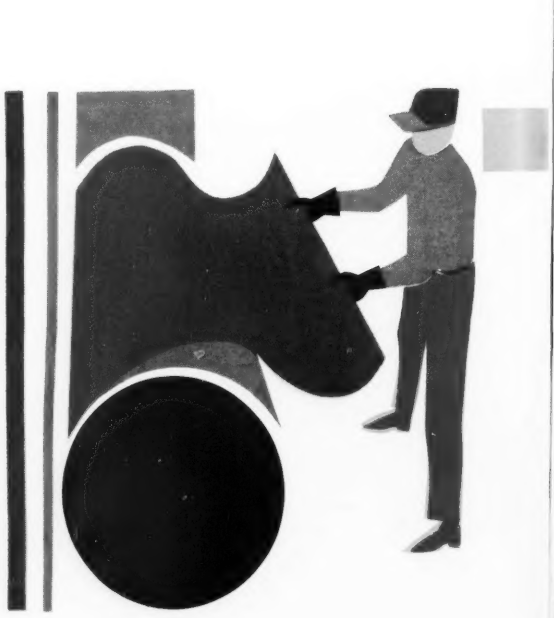
The facts behind the Micro-Black success story:

Users report 21 ways to improve rubber products, save time and money with Ameripol Micro-Black masterbatch

A little over two years ago, Goodrich-Gulf introduced a black masterbatch that was destined to revolutionize rubber processing. This product was Ameripol Micro-Black. And, it set a new standard in carbon black dispersion, made possible by an exclusive process —high liquid-shear agitation of latex and carbon black slurry.

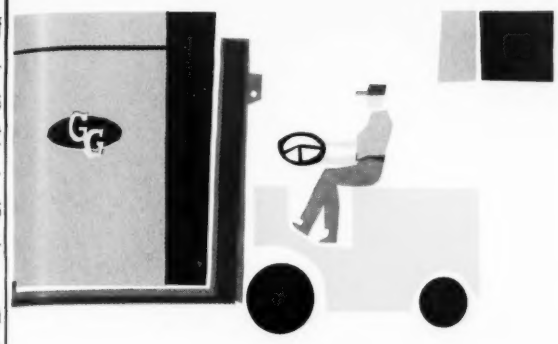
Micro-Black was tested by processors in a wide variety of product fields. And they came back for more. Proof: in the last 18 months alone—Ameripol Micro-Black sales are up 1400 per cent!

Now, here are the 21 ways Micro-Black has proven its ability to improve rubber products and save time and money:



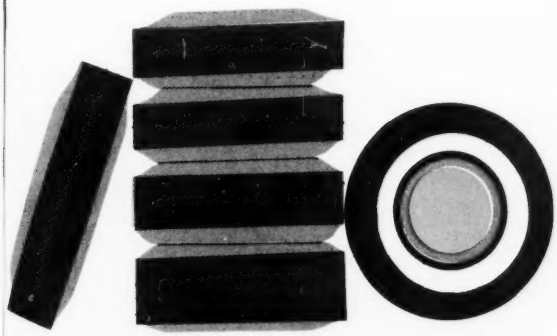
IN PRODUCTION, Ameripol Micro-Black . . .

1. Eliminates one weighing operation.
2. Eliminates one milling operation.
3. Shortens other mixing operations.
4. Releases mixing equipment for other uses.
5. Lowers power consumption.



IN STORAGE AND HANDLING,
Ameripol Micro-Black . . .

6. Is packaged in thirty-bale units for faster handling.
7. Does not cold flow.
8. Permits stocking a semi-processed material.
9. Is easy to warehouse.
10. Eliminates in-plant storage of carbon black.
11. Ends carbon black mess and clean-up expense.
12. Is readily available from two strategic shipping points.



IN THE END PRODUCT,
Ameripol Micro-Black . . .

13. Assures thorough dispersion of carbon black in the rubber.
14. Provides a uniform standard of quality control.
15. Reduces the number of rejects.
16. Adds substantially to abrasion resistance.
17. Prevents damage to rubber as caused by high-viscosity milling.
18. Provides a stronger bond between rubber and carbon black.
19. Permits performance advantages to be added at no increase in cost.
20. Reduces heat build-up.
21. Provides a promotable quality feature.

Recheck these 21 points and see how Micro-Black can improve your operations

Remember, these are all proven advantages of Micro-Black. This superior masterbatch has met the test of time, both in the plant and in the market.

Ameripol Micro-Black is available to you from the largest synthetic rubber producing capacity in the world. In addition to plants at Port Neches, Texas, and Institute, West Virginia, Goodrich-Gulf maintains complete technical service facilities to assist you with production problems.

Turn the page for information on the full selection of Micro-Black polymers . . .

Goodrich-Gulf Chemicals, Inc.

Choose from this complete line of 16 Ameripol Micro-Blacks

COLD MICRO BLACK	BLACK		OIL		Emulsifier	Stabilizer
	Type	Parts	Type	Parts		
1605	FEF	50	—	—	FA	NS
4658	EPC	50	—	—	MA	NS
4659	HAF	52	HA	10	RA	ST
4651	HAF	62.5	HP	12	RA	ST
4660	ISAF	52	HA	10	RA	ST
4664	ISAF	52	HA	12.5	RA	ST
4667	SAF	40	HA	5	RA	ST

COLD, OIL MICRO-BLACK	BLACK		OIL		Emulsifier	Stabilizer
	Type	Parts	Type	Parts		
4760	SRF	75	N	17.5	MA	NS
1810	FEF	100	N	50	FA	NS
1805	HAF	75	N	37.5	FA	NS
1809	HAF	75	HA	37.5	MA	ST
4756	HAF	75	A	37.5	MA	ST
1808	HAF	75	HA	50	MA	ST
4759	ISAF	75	A	37.5	MA	ST
4758	ISAF	82.5	HA	62.5	MA	ST
4761	SAF	65	A	37.5	MA	ST

How to put Micro-Black to work in your operation

Call your Goodrich-Gulf Sales Engineer. He'll come to your plant and help determine the right recipe and proper grade of Micro-Black to fit your needs. He'll help you test it, with the full cooperation of the Goodrich-Gulf Technical Sales Service Laboratory.

When you deal with Goodrich-Gulf, you can draw on the production and technical resources of the leader in the field. Call or write us at 1717 East Ninth Street, Cleveland 14, Ohio. Plants at Port Neches, Texas, and Institute, West Virginia.

Goodrich-Gulf Chemicals, Inc.

THE ONE TO WATCH FOR NEW DEVELOPMENTS

It is known, however, that United States Rubber has two plants near Havana, one making rubber footwear since 1945 and the other tires since 1958; that Goodyear Tire & Rubber has a 300-man tire plant that has operated since 1946; and that Firestone has what is said to be the most modern tire factory operating in Cuba. It, too, opened in 1958. At the same time, the companies have merchandising organizations on the island which also must be considered part of a very considerable investment.

While the rubber companies are not eager to discuss their precarious situation in Cuba, neither are the remaining favored few foreign investors who have been relatively unmolested in the upheaval which began nearly 20 months ago. In this select group are branches of U. S. banks and a group of light consumer goods producers. But it is known that these companies are finding life under the revolutionary regime no bed of roses. The rubber companies, for example, must be hurt by Castro's increasing importation of tires, particularly second-hand tires "dumped" on the island by U. S. suppliers.

Why didn't Castro grab the rubber companies along with everything else earlier this summer? When will he take them over? Or will he leave them alone? There are no solid answers to these questions here.

For a time U. S. Government experts on Cuba felt that Castro would go slow in taking over technical industrial operations such as the rubber companies in the knowledge that the army couldn't run them. If these installations were seized, this theory went, the U. S. managers would pull out, and the whole purpose of the takeover would be defeated. But Castro's experience with the three oil refineries (Esso, Shell, and Texaco) explodes this idea. Since they were taken over in July, and despite the fact that the companies' management was pulled out, Castro's men have been able to refine enough Soviet oil to meet the island's normal needs.

Not knowing exactly why they have been passed over, it is understandable why the surviving companies don't care to discuss the subject.

In the Congo, meanwhile, word that the $20-million 1960 rubber crop would be lost came from U. S. Ambassador Clare H. Timberlake, whose bleak survey of the Congo's economy of August 11 constitutes about the only definitive report on the situation.

In a dispatch to the State Department, Timberlake reported simply that "anti-white feeling" in the Congo's rubber-growing belt "forced almost complete withdrawal of Europeans, which now threatens total loss" of the rubber crop unless "security" is established before the late-September harvest. In late August there was little likelihood that this security could be established in time to get the crop in.

Wage Agreements Signed by Goodyear, Goodrich, Firestone, U. S. with URW

Are the annual wage agreements between labor and management in the rubber industry costing the companies progressively more each year? A glance at the record of these settlements, including the last one reached July 30, indicates this is in fact the case.

Three of the industry's top companies, Goodyear, Goodrich and Firestone, arrived separately at settlements with the United Rubber Workers Union on a general wage increase of 9.5¢ per hour, plus extra allowances for skilled trade employes. The agreements, reportedly reached in peaceful and quiet negotiations late in July, will become the pattern for the industry, as in past years. United States Rubber, for example, signed essentially the same agreement four days later.

The 9.5¢ July settlement constitutes the most liberal wage agreement reached under contract "reopener" negotiations in recent years. When URW contracts with the companies were "reopened" in 1954, the increase granted was 6.5¢. In 1956, the next reopened wage negotiation, the increase was 6.2¢, and in 1958 it rose to 8¢ an hour.

More liberal wage increases have been agreed to by the industry when new, biennial contracts are negotiated in off-years. Thus in 1953, negotiation of the standard two-year pact setting forth conditions under which the Union would work provided for a 12¢-per-hour increase in the industry. In 1955 the wage boost included in the new contract jumped to 14¢, and in the 1957 contract it went to 15¢. Last year, when URW and the companies failed to reach agreement on a new two-year contract, the larger firms were shut down with strikes of between three weeks and two months. In the final settlement, the wage increase was only 10¢ an hour, but wages were not at issue in the 1959 contract strikes, which were called over such non-economic conditions as pension and welfare plans and general working conditions.

The 9.5¢ general wage increase granted under the "reopener" clause, incidentally, is slightly in excess of the average 9.2¢ per hour median for wage settlements in various other industries in the first half of 1960.

Under the agreements hammered out in the July negotiations held in Cleveland and Cincinnati, URW managed to win concessions on other than wage demands. Firestone and Goodyear, for example, agreed to adjust inter-plant wage scales to bring workers' earnings more into line with the national average.

At the same time they agreed to advance skilled workers a slight premium in the wage increase. Firestone's agreement extends skilled employes a 4¢ boost in its tire plants in Akron, Des Moines, Los Angeles, and Pottstown, Pa. Goodyear granted skilled workers an extra 5.5¢ in its Jackson, Mich., plant, and Goodrich gave its skilled workers an extra 5¢ an hour.

The wage boosts cover 18,000 URW employes of Firestone, 12,600 at Goodrich, 21,000 at Goodyear, and another 24,000 at U. S. Rubber, which reached agreement on the 9.5¢ per hour yardstick on August 3.

Price Discrimination Charge Made by FTC

The Federal Trade Commission in August charged Inland Rubber Corp., Mansfield, O., with unlawfully discriminating in prices among its customers. The complaint charges that Inland, which makes automobile tires, tubes, and repair materials, has been charging some customers up to 18% more than other favored customers for its products.

The complaint further charges that Inland has used a quantity discount plan in the sales of tubes providing for the largest discounts to customers purchasing in lots of 5,000, but not giving the same discount price to all other competing customers.

The effect of these practices, FTC charged, may be to lessen competition substantially or tend to create a monopoly in violation of the Robinson-Patman Act. FTC granted Inland 30 days in which to file an answer to the complaint.

TBA Suit Appealed

The U. S. Fourth Circuit Court of Appeals in Baltimore ruled during August that Sinclair Refining Co. acted illegally in trying to persuade its dealers in the Baltimore area to handle only Goodyear Tire & Rubber Co. tires, batteries, and accesories (TBA).

The Appeals Court ruling overturned a decision by a lower Federal District Court which originally had dismissed a suit brought against Sinclair by one of its dealers who also operated a Firestone Tire & Rubber Co. retail outlet in another city. The dealer charged that Sinclair had cancelled his lease when he refused to handle only Goodyear TBA.

In reinstating the suit the Appeals Court found that the anti-trust laws were violated when Sinclair allegedly compelled its dealers to purchase a

quantity of a product when the dealers may prefer to buy another product. The court held that the overriding commission arrangement between Goodyear and Sinclair, under which the latter "sponsored" the former's TBA for a consideration, was an illegal tie-in.

Stockpile Sales

July sales of crude natural rubber from the national stockpile totaled 8,271 long tons, bringing to approximately 81,580 tons the total stockpiled rubber sold since the disposal programs began last October.

U. S. Rubber Fined

United States Rubber Co. was ordered by a federal judge in August to pay a fine of $15,000 on charges of conspiring to fix prices on foam rubber mattresses. U. S. Rubber accepted the fine after entering a plea of *nolo contendere*, which is to say it pleaded neither innocent nor guilty.

The penalty was imposed by Federal District Judge Alfred A. Arraj in Denver, Colo, after Justice Department Attorney Earl A. Jenkenson, Jr., charged that U. S. Rubber officials repeatedly had threatened not to sell to dealers or wholesalers who would not agree to prices set by the company.

In making the plea of *nolo contendere*, U. S. Rubber Attorney, J. G. Holland asserted that the violation of the anti-trust laws was "purely technical."

Earlier, U. S. Rubber paid a $20,000 fine after entering a *nolo contendere* plea to a federal charge that it had conspired with other firms to fix prices on industrial power belts.

CALENDAR OF COMING EVENTS

September 19-23
International Rubber Study Group. Kuala Lumpur, Malaya.

September 26-30
Instrument Society of America. Annual Meeting and Fall Instrument-Automation Conference and Exhibit. Coliseum, New York, N. Y.

September 26-October 1
International Natural Rubber Research Conference. Kuala Lumpur, Malaya.

September 29
Southern Ohio Rubber Group. Engineers Club, Dayton, O.

September 30
Rubber Chemical Salesmen's Association of Akron. University Club of Akron, Akron, O.

October 4
The Los Angeles Rubber Group, Inc.

October 7
The Philadelphia Rubber Group. Poor Richard Club, Philadelphia, Pa.
Detroit Rubber & Plastics Group, Inc. Detroit Leland Hotel, Detroit, Mich.
Chicago Rubber Group. Furniture Club, Chicago, Ill.

October 7-8
Southern Rubber Group. Roosevelt Hotel, New Orleans, La.

October 9-11
Rubber & Plastics Division and Erie Section, American Society of Mechanical Engineers. National Conference of Rubber and Plastics Engineers. Hotel Lawrence, Erie, Pa.

October 11
Buffalo Rubber Group. Continental Inn Hotel, Buffalo, N. Y.

October 12-23
Automobile Manufacturers Association. 1960 National Automobile Show. Cobo Hall, Detroit, Mich.

October 13
Northern California Rubber Group. Past Presidents' Night.

October 14
Boston Rubber Group. Hotel Somerset, Boston, Mass.

October 17
Elastomer & Plastics Group, Northeastern Section, American Chemical Society. Annual Meeting. Science Park, Boston, Mass.

October 17-21
National Safety Council. Forty-Eighth Annual National Safety Congress. Chicago, Ill.

October 21
New York Rubber Group. Henry Hudson Hotel, New York, N. Y.

October 28
Akron Rubber Group.
Rubber Chemical Salesmen's Association of Akron. University Club of Akron, Akron, O.

November 1
The Los Angeles Rubber Group, Inc.

November 3
Rhode Island Rubber Club. Pawtucket Country Club, Pawtucket, R. I.

November 4
The Philadelphia Rubber Group. Fall Dance. Manufacturer's Country Club, Oreland, Pa.

November 7-9
Chemical Institute of Canada. Canadian Chemical Engineering Conference. Quebec, P.Q., Canada.

November 10
Northern California Rubber Group.

November 18
Connecticut Rubber Group.
Chicago Rubber Group.

November 25
Rubber Chemical Salesmen's Association of Akron. University Club of Akron, Akron, O.

November 30-December 1-2
U. S. Army Signal Research & Development Laboratory. Ninth Annual Symposium on "Technical Progress in Communication Wires and Cables." Berkeley-Carteret Hotel, Asbury Park, N. J.

December 3
Northern California Rubber Group. Christmas Party.

December 9
Detroit Rubber & Plastics Group, Inc. Christmas Meeting. Statler-Hilton Hotel, Detroit, Mich.

December 10
Southern Ohio Rubber Group. Christmas Party. Miami Valley Golf Club, Dayton, O.

December 13
Buffalo Rubber Group.

December 16
New York Rubber Group. Christmas Party. Henry Hudson Hotel, New York, N. Y.
Boston Rubber Group. Christmas Party. Somerset Hotel, Boston, Mass.

1961

January 20-21
Southern Rubber Group. Statler Hilton Hotel, Dallas, Tex.

January 27
Akron Rubber Group.
Chicago Rubber Group.

February 7
The Los Angeles Rubber Group, Inc.

February 17
Detroit Rubber & Plastics Group, Inc.

March 7
The Los Angeles Rubber Group, Inc.

Rubber Expansion Joint for Pavements

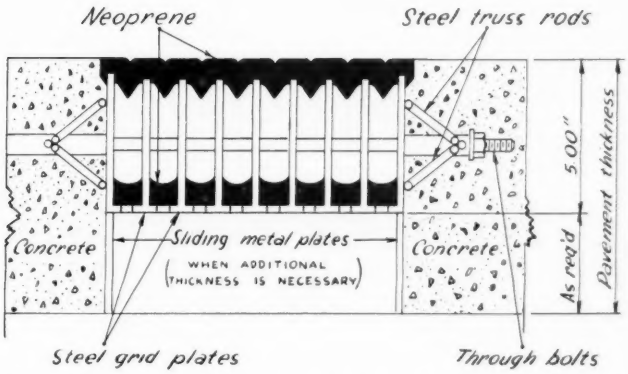


Fig. 1. Cross-section view of neoprene rubber expansion joint in a concrete pavement

Fig. 2. The joint is shown in both the compressed state *(upper)* and fully extended state *(lower)*, illustrating the three-inch possible movement of the unit

Rubber is helping meet some of the problems of the advanced motor or jet age in some glamorous and some not so glamorous ways. Typical of a new design that can hardly be classed in the glamorous category, but is certainly utilitarian and highly desirable is a new type of expansion joint for concrete developed by the B. F. Goodrich Industrial Products Co. which can absorb the movement of the concrete during extreme temperature changes without any bulge, dip, or gap in the top surface. At the same time the joint keeps a tight seal against water and dirt. The joint is now being used on highways, bridges, and airfield runways.

Constructed of neoprene rubber and steel, the joints have withstood incessant pounding by automobiles and trucks. These points, moreover, are resistant to oil and sunlight and withstand all types of weather and abrasion, it is further claimed. They will keep highways, runways, and bridge surfaces free of weather damage and will reduce repair and maintenance costs.

The joint is designed so the movement of concrete pushes together the neoprene cells or pulls them back to their original position like an accordion. Steel truss rods looping out from both sides anchor the joint securely to the end of each of the concrete panels. Because it is anchored in this manner, the surface stays flush with the top of the concrete. (Figure 1.)

Before installation, the joint is precompressed to the correct width by tightening the through bolts placed across the face of the joint. (See front cover.) As soon as the concrete has sufficiently hardened, the precompression holding pin is removed, releasing the pressure on the through bolt and allowing the unit freedom to contract or expand as it rides between the concrete panels. A neoprene plug is inserted to seal the hole left by removal of the holding pin. Ends of the joint are sealed, at the factory, with flexible diaphragms.

Each of the expansion joints is 13¼ inches wide and contains nine cells five inches high. It will accept a movement of three inches, but if the movement expected is less than three inches, fewer cells can be used per joint. (See Figure 2.) One cell accounts for ⅜-inch of movement. The units come in 6- and 6½-foot lengths, but can be joined together end-to-end to give the total length needed. Where the highway or airfield runway is thicker than five inches, sliding metal plates provide the desired thickness.

Exhaustive laboratory tests with the expansion joints have demonstrated that these joints, both neoprene and metal components, are virtually unaffected by the heaviest traffic conditions. One such test was the equivalent of a loaded truck carrying a 7,875-pound load cargo and pounding the same spot 3,120 times in 24 hours for three weeks in succession.

Firestone Celebrates Sixtieth Anniversary

The Firestone Tire & Rubber Co., Akron, O., celebrated its sixtieth anniversary on August 3 with publication of a brochure, in newspaper tabloid form, describing the company's growth in six fields during its 60 years.

The brochure notes that the company was founded by Harvey S. Firestone, Sr., in 1900, with assets of $20,000. At that time the firm sold tires made by other firms. In 1903 he bought a small building and hired 12 men to make buggy tires.

Today, Firestone notes, the company has 90,000 employes, assets of $800 million, a worldwide network of factories, its own rubber plantations in Liberia, Brazil, and the Philippines, and 12,000 products including tires, rubber products, synthetic rubbers, plastics, metal products, textiles and chemicals.

Kenneth Hartley

English Sales Head Visits Davis-Standard

Kenneth Hartley, sales engineer in charge of extruder sales for Fawcett-Preston, Bromborough, England, recently completed a three-week visit to Davis-Standard, division of Franklin Research & Development Corp., Mystic, Conn. During that time he traveled throughout the United States with Davis-Standard sales engineers, observing American production techniques and equipment and studying U. S. markets and applications for extruders.

Fawcett-Preston is a manufacturing licensee of Davis-Standard extrusion machinery for the Sterling area.

Bullard Clark Co. Building New Plant

The Bullard Clark Co., Jacobs Rubber Division, Danielson, Conn., has broken ground for a new plant in Dayville, Conn., for the manufacture of mechanical rubber goods.

The new plant will augment production in the badly congested Bullard Clark buildings in Danielson proper, the announcement said. The new factory will be located on a 39-acre tract of land in a new industrial park near Alexander's Lake in Dayville. According to the firm, the structure now being built will have 30,000 feet of floor space, with plans for expansion up to 100,000 square feet.

The plant is expected to be complete and in operation late this fall. The first plant in the industrial park, it is adjacent to the New York, New Haven & Hartford Railroad and close to the Connecticut Turnpike and has power lines through the property.

Committee D-11 Assigns New SBR Number to Latex

Committee D-11 on Rubber and Rubber-Like Materials of the American Society for Testing Materials, through Subcommittee 13 on Synthetic Elastomers, has assigned a new number, SBR 2114, for a high solids SBR latex at the request of the Goodyear Tire & Rubber Co.

DESCRIPTION OF TYPE OF STYRENE-BUTADIENE (SBR) LATEX, ASSIGNMENT OF NEW CODE NUMBERS—ASTM D-11 1420-56T

Number as assigned	2114
Date assigned	7/7/60
Distinctive feature	68% min. total solids content
Type	2105
Nominal temperature, °F.	50
Activator	FRA
Shortstop	ND
Catalyst	OHP
Emulsifier	FA
Nominal Mooney viscosity ML 1 + 4 (212° F.)—polymer	120
Residual volatile unsaturate, %	0.10
pH value	10
Coagulum on #80 screen, %	0.10
Bound styrene, %	24
Total solids, %	68

Note: Abbreviations and symbols are defined as follows:
FRA = free radical type
ND = non-discoloring
OHP = organic hydroperoxide
FA = fatty acid

Dow Organizes Unit For Urethane Sales

Dow Chemical Co., Midland, Mich., has announced organization of a new unit to handle sales in the field of urethane chemicals to "provide concentrated service in depth on polyglycols and derivatives for resilient foams, rigid foams and elastomers to the comfort cushioning, refrigerator, rubber, automotive, boat and construction industries."

Robert E. TenHoor, former head of the polymers chemicals section of Dow's technical service and development department will be manager of the new unit.

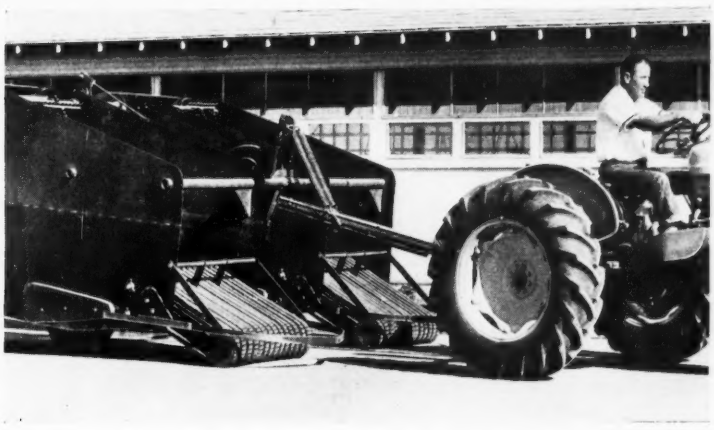
Dow also announced plans to market a line of urethane chemicals under the trade name, Vorane. This line will include the Voranol series of seven basic polyethers for flexible and rigid foams, and the Voranate R series of isocyanate adducts developed to provide versatility in producing cellular urethane for foamed-in-place rigid systems.

Enjay Chemical Co. Offers Resin Line

Enjay Chemical Co., a division of Humble Oil & Refining Co., New York, N. Y., has announced that its new Buton resins are now available in commercial quantities. The resins, a new line of butadiene-styrene polymers, are produced in the company's Baton Rouge, La., and Bayonne, N. J., plants.

Three resins are offered, Buton 100, a polymer of 80% butadiene and 20% styrene, and Buton 200 and 300, manufactured by reacting Buton 100 with a polarizing agent in the presence of a catalyst to introduce polar hydroxyl and carbonyl groups.

Attending a ground breaking ceremony for the new plant of The Bullard Clark Co. in Dayville, Conn., are, *left to right:* John C. Driscoll, industrial agent of the Connecticut Development Commission; Edward J. Bullard, board chairman of Bullard Clark; Lester E. Fitzpatrick, president of the Danielson Industrial Foundation; J. Edgar Moe, executive vice president of Bullard Clark, and Charles E. Wrinn, industrial power engineer of the Connecticut Light & Power Co.



The Rood cotton harvester, using rubber belts, picks up cotton that has fallen on the ground and would otherwise go to waste

Mobay Granted Patent On Urethane Process

Mobay Chemical Co., Pittsburgh, Pa., has been issued a United States patent for a process which includes production of polyether-based urethane foams, the company recently reported. It is Mobay's intention to grant royalty-free licenses to foam producers, the announcement said.

Under terms of an interference settlement which preceded issuance of the patent, E. I. du Pont de Nemours & Co., Inc., will have equal rights.

The patent, pertaining to reaction products of polyether resins and polyisocyanates, will apply to many fields, but initial commercial importance of the patent lies in production of the polyether-based urethane foams.

Mobay, a jointly-owned associate company of Montsanto Chemical Co., St. Louis, and Farbenfabriken Bayer A.G. Leverkusen, Germany, was formed in 1954 as a basic supplier of urethane chemicals.

Goodrich Sales Head Marks Retirement

Howard F. Miller, Los Angeles district field manager for the Associated Tires and Accessories division of The B. F. Goodrich Co., Akron, O., retired August 1 after 48 years in the sales end of the tire business.

He had been in the rubber industry since 1912. In 1928 he joined Goodrich as a tire salesman in the Indianapolis district. In 1943, after managing several Goodrich retail stores, he became manager of fleet tire sales. Then in 1945, Mr. Miller was made manager of petroleum company tire sales and in 1947 general supervisor for the San Francisco district. He was named district field manager of the Associated division in 1950.

Rubber Belts Pick Cotton

A new type of cotton picker equipped with 28 specially designed rubber belts may mean several million dollars of extra profit for the nation's cotton growers, the manufacturer says.

The machine, a Rood cotton harvester, is designed to pick up the cotton that has fallen on the ground after mechanical cotton pickers have harvested a field. Growers have found that the cost of hiring hand pickers to gather the scattered bolls is too expensive, and previous machines designed for the task have picked up too much dirt to be practical.

The Rood harvester employs 28 rubber belts made by B. F. Goodrich Industrial Products Co., Akron, O. The belts, 94 inches in circumference and two inches wide, have cross-cut slots spaced about ¾-inch apart. As the belts rotate, the slots open, they close as they leave the ground, picking up the loose bolls.

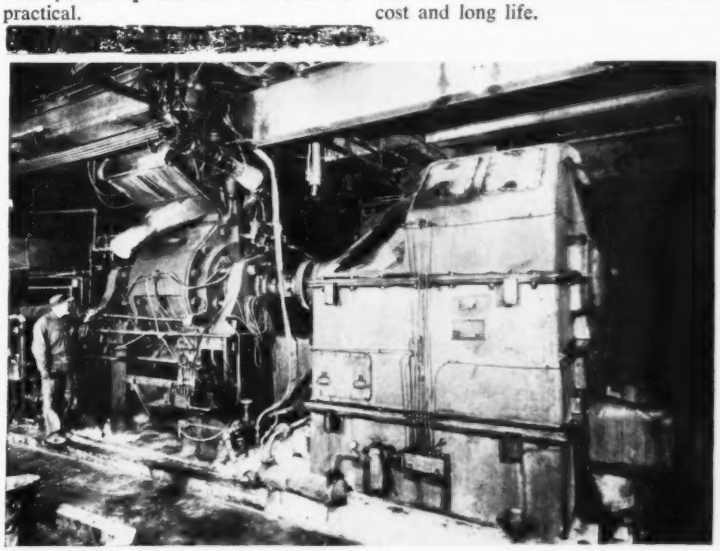
According to Goodrich, during the past harvest season a production model of the machine harvested 169 bales of cotton over a period of less than six weeks. The bales sold for more than $20,000 at an operating cost of picking of less than $3 a bale. In another test, Goodrich reports, the Rood harvester covered one 40-acre plot to bring in $1,850 net profit, and hand pickers on an identical plot brought in a net profit of $165.

Adamson Made Agent For Internal Mixer

Adamson United Co., Akron, O., has become the sole agent in the United States for manufacture, sales, and service of the Shaw internal mixer, on license from Francis Shaw & Co., Ltd., Manchester, England.

This mixer, to be sold under the name, Adamson-Shaw Intermix, will be available in a number of sizes from small laboratory types to large production machines.

According to the manufacturer, the Intermix kneads the material between nogged, interlocking rotors, rather than by the conventional method of using rotors to smear the batch against mixing chamber walls. The method is said to produce completely dispersed compounds in less mixing time. In addition, the manufacturer further states that the Intermix has low maintenance cost and long life.



The Adamson-Shaw Intermix, shown in operation

International Latex Buys Southern Latex

International Latex Corp., Dover, Del., has completed arrangements to purchase Southern Latex Corp., Austell, Ga., subject to approval of the boards of directors of both companies.

Southern Latex manufactures and sells latex compounds to the textile industry in the South. International Latex, through its chemical division, manufactures and markets nationally synthetic latex and resins for the textile, paper, paint, and adhesive trades.

The announcement said that Southern Latex Corp. will continue to operate as an autonomous company under direction of its president, D. C. Cochran, with no change in management and policies.

Goodrich Wins Patent On High-Speed Tire

John O. Antonson, a B. F. Goodrich tire design engineer, has been awarded a patent for a fabric-reinforced-tread high-speed airplane tire.

The tire, now used on most jet bombers, all Air Force front line fighters, and all commercial jets, according to Goodrich, has a tread laminated with multiple plies of nylon cord. The cords bind the tread to the tire carcass to keep centrifugal force from stripping the tread off the tire at high speed, reduce distortion of the tread under load, resist tread cutting and punctures, and prevent formation of high-speed shock waves that affect fast rolling tires.

The tire was first tested in 1949 when there was no aircraft that needed its high-speed capacity but Antonson felt that it was only a matter of time until heavier, faster aircraft would require high-speed tires. The tire was first used on the Regulus guided missile, which needed a tire that could take 300-mile-an-hour takeoffs with high loads. The tire's latest use is on North American Aviation Co.'s rocket-powered X-15.

John O. Antonson, Goodrich tire design engineer who developed this fabric-reinforced-tread high-speed airplane tire, checks internal temperature of a tire just subjected to a simulated takeoff in the laboratory

Flexible Rubber Pipe For Conservation Plan

Salmon and steelhead fingerlings, spawned upstream of Brownlee Dam on the Snake River between Idaho and Oregon, are being delivered to waiting tank trucks for delivery downstream by being pumped through 3,250 feet of Condor flexible rubber pipe manufactured by the Manhattan Rubber Division of Raybestos-Manhattan, Inc., Passaic, N. J.

The seaward-bound fish are diverted to traps by a fine-mesh barrier 120 feet deep, from there to the eight-inch pipe, and hauled 15 miles downstream in the specially aerated and refrigerated trucks, where they are returned to the river. Condor rubber pipe was selected for its strength, flexibility, and abrasion resistance.

Pennsalt Acquires Share in Dutch Firm

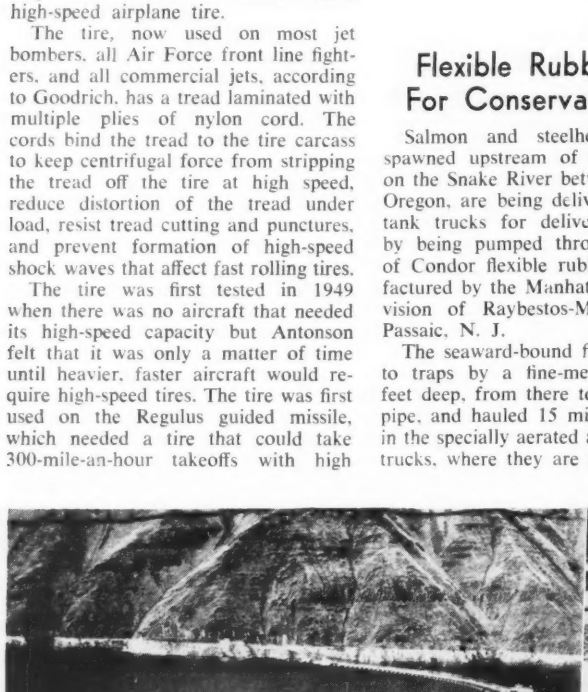
Pennsalt Chemicals Corp., Philadelphia, Pa., has completed arrangements to acquire "a substantial interest" in N. V. Fabriek van Chemische Producten, Vondelingenplast, Holland.

The Dutch firm, located near Rotterdam, makes rubber chemicals, organic chemical intermediates, plastic films, dyestuffs, pesticides, and formic and oxalic acids and their derivatives. Pennsalt produces rubber chemicals, organic sulfur compounds, hydrofluoric acid, chlorine, caustic soda, a complete line of alkyl amines and derivatives, and a number of other industrial chemicals, plus such fluorine products as Isotron refrigerants, aerosol propellants, and a recently announced fluorinated plastic.

Plans call for immediate construction of new facilities at Vondelingenplast for manufacture of tertiary dodecylmercaptan and other organic sulfur compounds to supply the growing European synthetic rubber industry, Pennsalt announced. It said the estimated $2,000,000 construction program will also expand facilities for manufacturing plastic films, oxalic acid, and dyestuffs.

William P. Drake, president of Pennsalt, said in the announcement of the acquisition that the move enables Pennsalt to manufacture in Europe Pennsalt products which have good sales potential in the European Common Market area, and to manufacture products of the Dutch firm in the United States, Mexico, Canada, and other countries in which Pennsalt operates.

It was further said that Pennsalt plans to introduce the Vondelingenplast pesticide line in the United States, Mexico, and Canada in 1961, and to manufacture other of the Dutch firm's products here when market studies have been completed.



In a multi-million dollar experiment in conservation, fingerling salmon and steelhead are trapped in this net stretched in an arc across Brownlee Reservoir

The young fish are pumped through Condor flexible rubber pipe, shown here, to special trucks which carry them back to Snake River 15 miles downstream

news briefs

GOODYEAR TIRE & RUBBER CO. has produced four billion pounds of Plioflex SBR at its Houston, Tex., plant, the largest amount of synthetic produced to date, by any United States company, Goodyear President Russell DeYoung reported. The plant began production in October, 1943, as one of four operated by Goodyear for the United States Government during World War II. It took nearly 7½ years to turn out the plant's first billion tons, but only 23 months for the fourth billion, the announcement said.

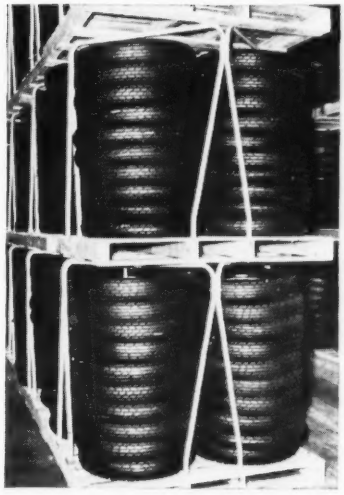
HERSHBERG RUBBER PRODUCTS CO., Ashtabula, O., manufacturer of custom-molded hard and soft rubber parts and lathe cut washers, has changed its name to Ashtabula Rubber Co. The new name in no way implies any change in ownership or management.

INSULATING FABRICATORS, INC., East Rutherford, N. J., has purchased the Continental Diamond Fibre Co. plant in Spartanburg, S. C., and renamed it Insulating Fabricators, Inc., Southern Division. New equipment is being installed for fabrication of all types of thermosetting and thermoplastics sheets, rods, and tubes.

BECCO CHEMICAL DIVISION, Food Machinery & Chemical Corp., Buffalo, N. Y., has moved its administrative and sales headquarters to 161 E. 42nd St., New York 17, N. Y.

GOODYEAR TIRE & RUBBER CO., Akron, O., has appointed Joseph Mandell & Co., Inc., Boston, Mass., distributor for its flooring products in the general area of Maine, New Hampshire, Vermont, Rhode Island, and Massachusetts, except for Berkshire County and western Massachusetts.

STILLMAN RUBBER CO., Culver City, Calif., has announced a new silicone rubber compound for O-rings and molded shapes which meets MIL-R-25988 specifications. Used in the manufacture of Stillman O-rings where physical and chemical resistance to fuels and hydraulic fluids is of extreme importance, Compound No. TH-1047 maintains its physical characteristics over a temperature range of —75 to over 400° F., the manufacturer claims.



This new type of tire rack, which leaves the four corners open to allow picking tires from any pallet without disrupting pallets stacked above, has been introduced by Warehouse Storage Systems Co., Hatfield, Pa. Each unit stores approximately 45 standard passenger tires in a vertical clearance of 48 inches, and may be secured to pallets permanently or mounted for easy removal, the manufacturer says. Maximum stability is said to be gained by the rack's eight-legged design

GIRDLER PROCESS EQUIPMENT DIVISION, Chemetron Corp., Louisville, Ky., has licensed Vitapol Ltd., a subsidiary of Vitafoam, Ltd., Manchester, England, to make vinyl plastic foam by the "Elastomer" process. Vitapol will offer the new product for trim panels in automobiles, as welded trim in upholstery, and for soundproofing and other applications

ALLIED CHEMICAL CORP., New York, N. Y., has cut prices for five of its eight low molecular weight polyethylene grades, powdered grades GA and 617A, pelletized grades 6 and 617, and grade 615. A-C polyethylenes are used in the rubber industry as a release agent for a number of elastomers.

B. F. GOODRICH TIRE CO., a division of The B. F. Goodrich Co., Akron, O., will expand its Miami, Okla., plant to produce passenger tires for Sears Roebuck & Co. The plant expansion is scheduled for completion in 1961. Included are facilities for production of white sidewall tires, the first to be made at the Miami plant.

GOODYEAR TIRE & RUBBER CO. OF CANADA, LTD., New Toronto, Ont., has opened its new $4½-million plant for the manufacture of tires at Medicine Hat, Alta.

EASTMAN CHEMICAL PRODUCTS INC., chemicals division, New York, N. Y., has established a new office at 4498 Main St., Buffalo, N. Y., to handle sales of industrial and specialty chemicals in western New York, western Pennsylvania, and southern Ontario, Canada. This new office will be under the supervision of George O. Trabue, formerly in the company's Cleveland office.

THE BEEBE RUBBER CO., Nashua, N. H., has opened a quality control and research laboratory in a new 2,500-addition to its Nashua plant. This laboratory, designed for research and development of new rubber products for the footwear industry and quality control checking of production, contains machinery for duplicating factory operations.

SEIBERLING RUBBER CO., Akron, O., has introduced a new fast-cure tread rubber before winter weather sets in, in order to meet the growing demand for retreaded snow tires. Because of the rush among motorists to recap worn conventional tires with a snow tread at the last minute, the retread facilities of tire dealers are taxed, and the fast-cure rubber will enable dealers to increase their retread capacity markedly, the company reports.

THE AMERICAN STANDARDS ASSN., New York, N. Y., has approved specifications for polysulfide sealing compounds for the building trade. The specification, "American Standards Specification for Polysulfide Base Sealants for the Building Trade," is coded A116.1-1960. It covers application of polysulfides to concrete, aluminum, stainless steel, and glass surfaces.

The Los Angeles (Calif.) Parks & Recreation Department uses these diesel-powered tractors, equipped with the big, low-pressure Terra-Tires built by the Goodyear Tire & Rubber Co., Akron, O., to clean and maintain 12 miles of beach. The tractors pull huge rakes which comb debris from the beaches. Terra-Tires, which are 46 inches high and 24 inches wide, give traction in the soft, loose sand, it is said

BOSTON WOVEN HOSE & RUBBER DIVISION, American Biltrite Rubber Co., Inc., Cambridge, Mass., has appointed Sutton-Clark Supply, Inc., Richmond, Va., a warehousing distributor. The appointment was made to supply customers in Virginia and North Carolina.

WELLCO SHOE CORP., Waynesville, N. C., has acquired a tract of land adjacent to its present property to build an additional manufacturing plant. This new building will be the fifth addition constructed to accommodate expanded production and will enable streamlining of production in order to offset rising labor and material costs.

CLEVITE HARRIS PRODUCTS, INC., a subsidiary of Clevite Corp., Cleveland, O., plans a 50% expansion of its rubber molding plant at Milan, O. The expansion will add 27,000 square feet space to the existing 55,000 square feet of manufacturing space, in the first phase of a projected three-year expansion program.

N. V. TRANSICOL, Geertruidenberg, Holland, a Netherlands subsidiary of Heyden Newport International Corp., New York, N. Y., U.S.A., is beginning construction of a new plant in Geertruidenberg to supply para-methane hydroperoxide, a catalyst used in the production of SBR rubber.

THE GOODYEAR TIRE & RUBBER CO., Akron, O., will test a new asphalt rubberizing compound by installing test sections in the Amarillo, Tex., highway district this fall. The compound, Rubarite S-1-40 Q.D., a quick dispersion product, contains 40% synthetic rubber and 60% sericite mica. Used in asphalt, it is said to make the asphalt more elastic and durable and give it a tighter grip on cover stone.

Officials of Pioneer Rubber Co., Willard, O., check a gift of 18,500 pairs of surgical gloves being sent as a gift from the company to the *S. S. Hope*, the floating American hospital ship that will visit Southeast Asia shortly on a mercy mission. The gift, a year's supply, includes latex and neoprene surgeon's, examination, and obstetrical gloves. Inspecting the shipment are, *left to right*, John R. Jones, general sales manager; J. H. Gibson, Pioneer president; and Marjorie Beamer, in charge of surgical sales

PARKER SEAL CO., Culver City, Calif., has developed a new 90-durometer "Viton" O-ring compound which meets specification AMS 7279 and is designed to solve problems involving high-temperature and high-pressure static and dynamic applications. The product, V498-9, is a high-temperature fluid-resistant fluorocarbon compound. Tests indicate good results where application is for use in contact with air, fuels, lubricants, and hydraulic fluids at temperatures up to 500° F.

THE GENERAL TIRE & RUBBER CO., Akron, O., has named Herbert C. Ludwig, Orange, N. J., exclusive sales agent for "Vygen," the flexible magnetic material manufactured by General Tire. The magnetic tape is able to replace lock mechanisms on such items as freezers and refrigerators.

B. F. GOODRICH CHEMICAL CO., Cleveland, O., plans building a factory in Colombia to manufacture Geon vinyl plastic. The plant, to be constructed at Zipaquira, near Bogota, will be the first to produce poly (vinyl chloride) in Colombia. According to Goodrich, virtually all the raw materials used in the operation will be Colombian, and the plant will be large enough to supply all Colombian requirements for the plastic. Production is expected to start in 1962.

SCOVILL MFG. CO., Waterbury, Conn., has purchased the assets of International Couplings Inc., division of The Gabriel Co., Cleveland, O. The products formerly manufactured by International Couplings will be consolidated with Scovill's line of industrial couplings.

SOCIETE AFRICAINE MICHELIN proposes to manufacture tires for all kinds of vehicles in a factory at Hussein Dey, near Algiers. Output, expected to be at the rate of about 6,000 tons annually, is intended chiefly for the Algerian market, but exports to Tunis are also contemplated as well as to Morocco, where there will be competition with the newly established Firestone Works.

RELIABLE BELTING & TRANSMISSION CO., Toledo, O., has been appointed distributor for Dayton Industrial Products Co.'s complete line of industrial hose, serving the northern Ohio area. Reliable will also operate an industrial hose warehouse in Toledo for Dayton Industrial Products.

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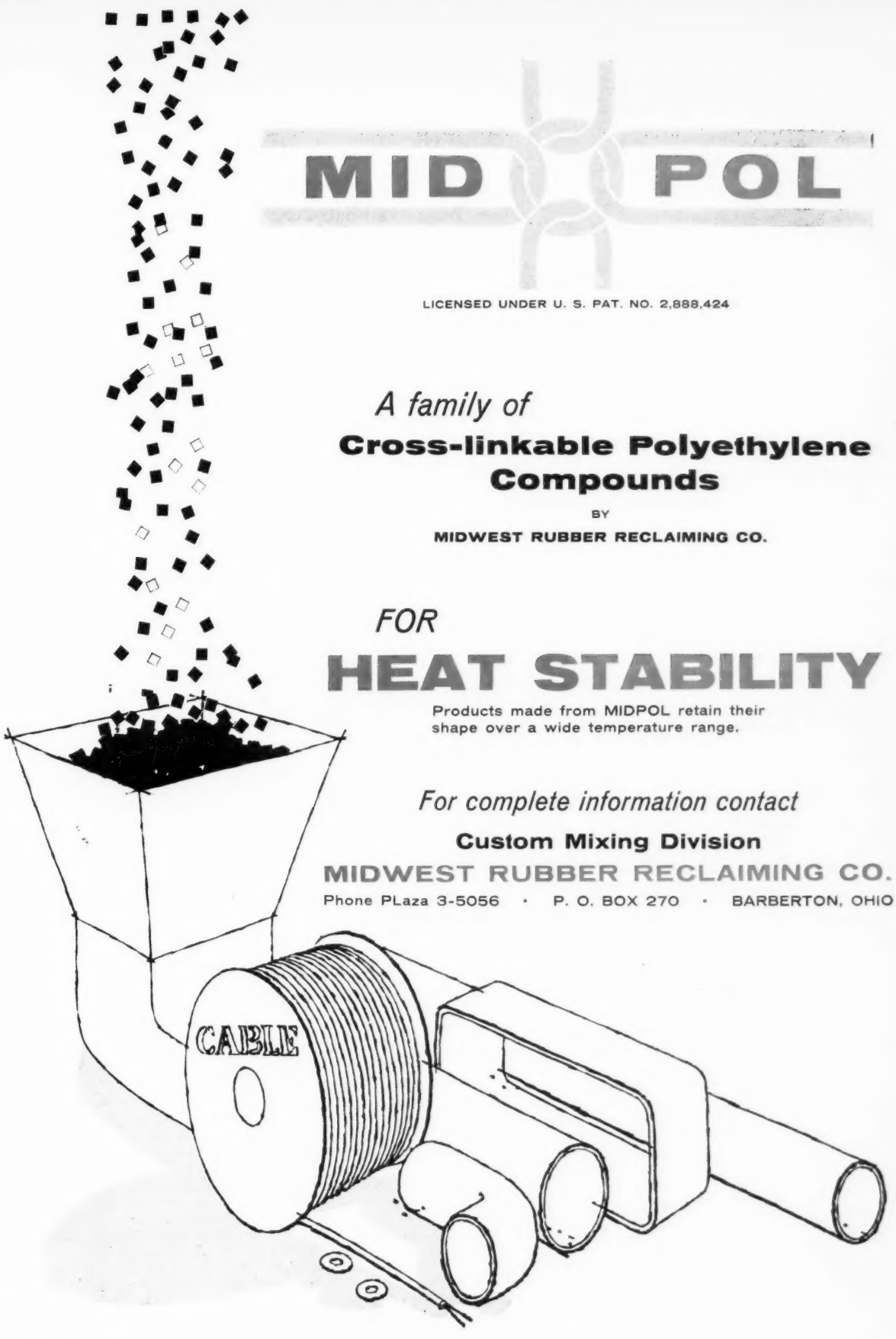

news about people

A. M. (Tony) Flasco has been named coordinator of all Western Hemisphere operations for The General Tire & Rubber Co., Akron, O. In addition he is now assistant to C. F. O'Neill, vice president in charge of overseas operations. As part of his new duties, Flasco is director of Pan-American General Tire Co., a wholly owned subsidiary.

Robert G. Smith and **John Seidler** are now vice presidents of Whittaker, Clark & Daniels, Inc., New York, N. Y. **W. H. Snyder** is assistant secretary; and **Albert E. Williams,** sales manager.

Max E. Roha has been named manager of plastics research at The B. F. Goodrich Co. Research Center, Brecksville, O. He was formerly a senior scientist in the plastics research group.

Harlis E. Martin, Charles W. Pearce, and **Frank T. Mountjoy** have joined Oakite Products, Inc., New York, N. Y., as technical service representatives. Martin has been assigned to Rock Island, Ill. Pearce will cover the Miami, Fla., area; while Mountjoy joins the Kansas City, Mo., staff.

Fred T. Kottenstette becomes group leader for sales development for Texas Butadiene & Chemical Corp., New York, N. Y. He was formerly a chemical salesman in the Houston, Tex., office.

Gene P. Robers is the new general sales manager, Thermoid division, H. K. Porter Co., Inc., Pittsburgh, Pa. He joins Porter after having been vice president of the Carter Carburetor Division, ACF Industries.

R. Emerson Lynn, Jr., as the new manager of program planning for B. F. Goodrich Chemical Co., Cleveland, O., will be responsible for integrating plans for new product development and for the development of project evaluation techniques.

Henry A. Brundage, division manager of the comptroller's office, Goodyear International Corp., Akron, O., has been appointed comptroller, Goodyear Tire & Rubber Co. of Canada, Ltd., New Toronto, Ont., Canada.

J. L. Masters

J. G. Eisenhart

David Eisenhart

J. L. Oglesbee

John G. Eisenhart, Jerry L. Masters, Jack L. Oglesbee, and **David Eisenhart** have been appointed sales representatives, Firestone Synthetic Rubber & Latex Co., Akron, O. John Eisenhart will cover the Philadelphia, Pa., area. Masters is a representative for the Akron vicinity. Oglesbee will handle the Atlanta, Ga., territory; while D. Eisenhart serves the Boston, Mass., area.

E. R. Rowzee became the first recipient of the R. S. Jane Memorial Lecture Award and received a commemorative scroll at the closing banquet of the forty-third Canadian Chemical Conference of The Chemical Institute of Canada, Ottawa, Ont. Dr. Rowzee, an internationally known authority on the synthetic rubber industry, is president and managing director of Polymer Corp., Ltd., Sarnia, Ont., Canada. The award, in memory of the late R. S. Jane, a noted Canadian chemical industry executive, is presented to a resident of Canada for exceptional achievement in a field of chemical engineering or industrial chemistry. The lecture itself will be presented by Dr. Rowzee at the Canadian Chemical Engineering Conference of CIC, scheduled for November 7-9 in Quebec, P.Q.

James L. Musgrove is now southwestern regional sales manager for Instron Engineering Corp., Canton, Mass., and will set up offices in Houston, Tex.

John W. Runkel, Francis W. Linehan, and **Benjamin B. Butler** are now district managers for the western operations department of The Borden Chemical Co., a division of The Borden Co., New York, N. Y. Runkel, with headquarters in Springfield, Oreg., will be responsible for sales and manufacturing activities in Oregon, southern Idaho, and Wyoming. Linehan, at Seattle, Wash., will handle the Washington and Canada areas; while Butler will cover the California area from Los Angeles, Calif. Butler will also coordinate the activities of the company's West Coast engineering department.

James R. Gundlock heads the new Cleveland, O., sales force for the mechanical goods division, United States Rubber Co., New York, N. Y. The new sales facilities are at 7208 Euclid Ave., Cleveland 3, O., where the tire and footwear divisions also have sales offices. The new division's products will include industrial hose, conveyor and elevator belting, power transmission products, mats and matting.

Harold H. Clark becomes resident sales engineer in the Akron, O., area for Spadone Machine Co., South Norwalk, Conn., manufacturer of machinery and equipment for the rubber, plastics, and textile industries. His office is at 2036-14th St., Cuyahoga Falls, O.

Joseph G. Nemeth is now vice president of Insulating Fabricators, Inc., East Rutherford, N. J., and **William G. Ficken** is sales manager.

John M. Fasoli, the newly appointed manager of commercial operations for the organic chemicals division, American Cyanamid Co., New York, N. Y., is responsible for coordinating activities of the division's commercial development department and the six commercial departments which include dyes, explosives and mining chemicals, textile chemicals, rubber chemicals, petrochemicals, and intermediates. He will be stationed in Bound Brook, N. J.

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Matar Studio

J. R. Alexander D. H. Francis

James R. Alexander has been elected vice president in charge of sales of The New Jersey Zinc Co., New York, N. Y. Alexander, formerly vice president, sales, of H. K. Porter Co., Inc., Thermoid division, succeeds **Robert G. Kenly,** who will assume new administrative duties.

Gordon R. Shearer has been named manager of productivity and planning, Dunlop Tire & Rubber Corp., Buffalo, N. Y. He began his career with Dunlop Rubber Co., Ltd., Birmingham, England, and later undertook a series of special assignments which included supervising manufacturing of truck tires and, more recently, passenger and aircraft tires.

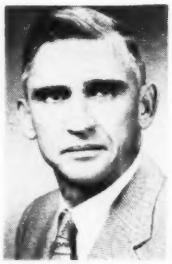
Thomas E. Burke now is manager of the public relations department at Seiberling Rubber Co., Akron, O. Since 1956 he was a member of the public relations staff.

Charles Histed has been appointed assistant sales manager, Stillman Rubber Co., Culver City, Calif., and is now in charge of out-of-state sales activity by distributors and representatives, of sales offices, and of evaluation of new markets and areas. He was formerly, for the past seven years, district manager of sales in the eastern United States for Stillman.

Joseph G. Woppman has been made plant manager (a new position) at the Palmyra, N. Y., facilities of Garlock, Inc. He was formerly manager of the industrial engineering department, manufacturing division, the post now being filled by **Borden R. Bond. Jack A. Henderson** has been named supervisor of the research and development section of the engineering department at Garlock.

Paul E. Paules becomes western regional manager for the scientific and process instruments division, Beckman Instruments, Inc., Fullerton, Calif. He will manage sales and service operations for the division's western region which includes the far western states, Alaska, Hawaii, and western Canada.

D. H. Francis has been appointed manager of chemical products production for The Goodyear Tire & Rubber Co., Akron, O., succeeding **H. I. Belknap,** who becomes a consultant in chemical production operations. Francis will assume his new duties on January 1. He will also direct the selection of the management team for the firm's new synthetic rubber plant at Beaumont, Tex., beginning this month. **G. H. Reynolds** will fill Francis's former post as general manager of the company's subsidiary at Portsmouth, O.



R. H. Dorsett A. B. Craig

Allen B. Craig has been promoted to assistant sales manager, rubber chemicals division, Witco Chemical Co., New York, N. Y. Now responsible for the sale of Witco-Continental carbon black in the South and Southwest, he will work out of headquarters in Houston, Tex. **Richard H. Dorsett** succeeds Craig as southwestern district sales manager for the organic chemicals division and moves from Dallas to Houston. The territory includes Texas, Oklahoma, Louisiana, Arkansas, and Mississippi. **Robert Stevenson** has been transferred from Houston to Dallas, Tex.

William R. Moffitt has been named senior vice president for manufacturing and engineering of The Borden Chemical Co., division of The Borden Co., New York, N. Y. He was formerly a vice president and technical director of the chemical division.

M. R. Poston has been made secretary and assistant general counsel of American Enka Corp., New York, N. Y., succeeding **Maurice Winger, Jr.,** recently named general manager of the William Brand-Rex Division. Poston was formerly assistant secretary.

George W. Flanagan is now manager of defense sales and service for B. F. Goodrich Chemical Co., Cleveland, O., and will also continue to serve as the company's Washington representative. He will assume the propellant materials sales activities of **Marcy W. Osborne,** named general manager of B. F. Goodrich-C.S.R. Chemicals Pty. Ltd., Sydney, Australia.

Willard Stewart, Inc.

P. E. Dobbs R. S. Griffin

R. Scotton Griffin has advanced to manager of the central district, E. I. du Pont de Nemours & Co., Inc., Wilmington, Del., with headquarters in Chicago, Ill. He replaces **Russell A. Kurtz,** now marketing manager for elastomers, Du Pont de Nemours International, S.A., Geneva, Switzerland. **Peter E. Dobbs** will fill Griffin's former post as assistant manager of the Akron, O., district. **Francis G. Falvey** moves from Detroit, Mich., to take over Dobbs' old assignment as salesman in the Akron district; while **James A. Margedant, Jr.,** goes to the Detroit office from the elastomers laboratory in Wilmington.

Roy W. McCune succeeds **O. H. Stork** as plant manager for The Springday Co., Springfield, Mo. **Russell Fultz,** assistant plant manager, assumes McCune's previous duties as factory manager at Dayco Southern, Waynesville, N. C. Stork retired after 36 years with the Springday. Both Springday and Dayco Scuthern are divisions of Dayco Corp., Dayton, O.

Robert E. Davies has been made technical manager in molded goods, B. F. Goodrich Industrial Products Co., Akron, O. He was project engineer on passenger-tire development for B. F. Goodrich Tire Co. since 1957.

Robert P. Dames has been assigned to the New York area office, Emery Industries, Inc., Cincinnati, O. He will handle Emery's line of fatty acids and hydrogenated glycerides in the territory including northern New Jersey, central and northwestern Pennsylvania, central New York, and western Maryland.

W. R. Mitten, Paul Ishmael, and **Troy E. Mullins** have joined the research laboratories of Golden Bear Oil Co., Bakersfield, Calif., as chemists working in the field of rubber.

D. C. Giles has been named to the newly created post of manager of marketing of Pure Carbonic Co., a division of Air Reduction Co., Inc., New York, N. Y. **M. C. Kramer** becomes manager of technical sales.

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J. B. Lovell

G. J. Sella, Jr.

James B. Lovell has been made a sales representative for the central district of the silicone products department, General Electric Co., Waterford, N. Y., and will make his office at Milwaukee, Wis.

Anthony Latona is the new manager of the adhesive division's latex and plastisol compounding and development laboratory, B. F. Goodrich Industrial Products Co., Akron, O. Prior to this appointment he served as senior product engineer in the division.

William R. Tise moves to the Passaic, N. J., plant to become chief engineer for conveyor products sales, United States Rubber Co., New York, N. Y. Prior to this appointment he was West Coast sales engineer for conveyor products.

Simon Collier, retired quality control director, and now consultant to Johns-Manville Corp., New York, N. Y., received from the American Society for Quality Control, Milwaukee, Wis., an award for efforts to advance the field of quality control.

Alvin E. Jerome, as sales representative for the Polyco-Monomer department, The Borden Chemical Co., a division of The Borden Co., New York, N. Y., will be responsible for the sale of the department's full line of synthetic resins and will make his headquarters in Leominster, Mass.

Charles A. Wyman has been elected chairman of the board, and **Henry W. Wyman,** president, of H. O. Canfield Co., Bridgeport, Conn. In addition, **Harry A. Russell** has been chosen executive vice president; and **John D. Foley,** vice president in charge of manufacturing, has been named a member of the board.

William R. Simmons becomes a salesman for the Kentucky-Indiana territory, American Mineral Spirits Co., Chicago, Ill. From his office in Louisville, Ky., he will represent the company in sales of technical naphthas, petroleum solvents, and waxes.

George J. Sella, Jr., recently was appointed sales manager of the rubber chemicals department, American Cyanamid Co., New York, N. Y., with headquarters in Bound Brook, N. J. Prior to this new appointment he was product manager.

G. Stephen Glaser, new sales representative, eastern district, silicone products department, General Electric Co., Waterford, N. Y., will make his office in Newark, N. J.

George A. Daum, now technical service manager for Hycar special-purpose rubber, B. F. Goodrich Chemical Co., Cleveland, O., will be responsible for all technical service activities for Hycar customers.

G. A. Daum

L. L. Linton, Jr.

L. L. Linton, Jr., has been assigned to the Atlanta, Ga., sales district, chemical division of The Goodyear Tire & Rubber Co., Akron, O. Linton will handle sales and services of synthetic rubber latices, vinyl resins, and chemicals.

Harry S. Pritchard has retired as vice president, new developments, Dunlop Canada, Ltd., Toronto, Ont., Canada, after having completed 33 years of continuous service.

George Meyer is now manager of manufacturing, Parker Seal Co., Culver City, Calif. He will be responsible for all the company's manufacturing facilities in Culver City, East Los Angeles, Calif., and Berea and Lexington, Ky. **William Swan** is assistant sales manager. He previously covered Dayton, O., and the surrounding area for the company.

Richard G. Bauman has been named manager of tire research, products research and development department, The B. F. Goodrich Co. Research Center, Brecksville, O. Previously, he was a senior scientist in the new products department at the Center.

I. L. Goldner has been appointed vice president and sales manager of British Footwear, Ltd., Montreal, P.Q., Canada.

G. S. Glaser

Ten Broeck

W. T. L. Ten Broeck has been made natural rubber coordinator for The Goodyear Tire & Rubber Co. research division, Akron, O. He has been director of research, and manager of factory operations at the company's Dolok Merangir rubber plantation in Sumatra.

Tom Spearing, former district manager in St. Louis, Mo., for Kleinert's, New York, N. Y., has been promoted to field sales manager.

Robert L. Parkin, newly named advertising and sales promotion coordinator for the industrial chemicals division, Enjay Chemical Co., New York, N. Y., will work with the division's marketing and technical service coordination section. He will also assist in advertising and sales promotion activities for the new chemical raw materials division.

Raymond E. Hess, associate executive secretary, American Society for Testing Materials, Philadelphia, Pa., will now serve as acting executive secretary and will continue as technical secretary and editor-in-chief. **Robert J. Painter,** executive secretary since 1952, is to be consultant to the executive secretary and will continue as treasurer of ASTM and will give concentrated attention to long-range planning work. Painter has been convalescing from several hip operations.

Leslie P. Clark has been appointed assistant export manager of The Borden Chemical Co., a division of The Borden Co., New York, N. Y. In his new position he will assist in the sale of the company's complete export line in all overseas areas. Mr. Clark's previous experience was gained in the export department of United States Rubber Co.

Russell E. Montgomery has been elected managing director of B. F. Goodrich Australia, Pty., Ltd., Melbourne, Australia, a subsidiary of The B. F. Goodrich Co., Akron, O. The Melbourne plant was completed and began production this year.

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Philip R. Sayre moves up to the position of technical superintendent at the Ashtabula, O., chemical plant, The General Tire & Rubber Co., Akron, O. He will supervise quality control testing of new products and processes and direct the development of new products at the plant.

Thomas E. James now is plant manager at the DuBois, Pa., rubber thread products plant, B. F. Goodrich Industrial Products Co., a division of The B. F. Goodrich Co., Akron, O. He was formerly manager of the company's plastic refrigerator gasket plant at New Ulm, Minn.

Nathaniel S. Dodge, Jr., succeeds his father, the late Nathaniel S. Dodge, as president of The American Rubber Mfg. Co., Oakland, Calif. Dodge, Jr., was executive vice president for the past six years.

David Craig and **Forest W. Shaver** are among the first to receive the new designation of research fellow, The B. F. Goodrich Co. Research Center, Brecksville, O. Dr. Craig was formerly a research associate, and Dr. Shaver a senior scientist directing research on rubber chemicals and polymer derivatives. Research fellows will choose and explore fundamental research projects, consistent with the company's research and development policy.

Theodore T. Foley is the new general sales manager of Pneus "General" S. A., Rio de Janeiro, Brazil, and will be in charge of all General Tire sales in that country.

R. Donald Stafford, newly named senior project evaluator for B. F. Goodrich Chemical Co., Cleveland, O., will assist in developing project evaluation techniques and in evaluating and integrating plans for product development programs. His previous position was senior development scientist.

Thomas Garcia-Borras, has joined Godfrey L. Cabot, Inc., Boston, Mass., as a research chemist in the organic and polymer research section, new products research department. **Frederick L. Muller,** who worked with Cabot as a cooperative student while studying at Northeastern University, now is a chemical engineer in the applied research section, new products research department. In addition, **Sumner G. Roper, Jr.,** is a microscopist in the fundamental research section, carbon black technical department; while **Howard H. Zabusky** becomes a plastics engineer at the organic and polymer research section, Billerica Research Center.

obituaries

Stewart Bolling

Stewart Bolling

Stewart Bolling, president of Stewart Bolling & Co., Inc., Cleveland, O., died suddenly, August 4, at Vanderpool, Va.

Mr. Bolling worked for General Electric Co. after his graduation with a degree in engineering from Virginia Polytechnic Institute. In 1925 he founded his own company to handle and rebuild used rubber processing machinery. Later he recognized that improvements could be made in the design of various machines, and the company began to design and build new equipment. Mr. Bolling held many patents for machinery for both the rubber and plastics industries.

Recently, the deceased had devoted time to breeding prize-winning cattle and sheep on his properties in Staunton, Va., where he was born, April 4, 1885. Funeral service and burial took place there on August 6.

Surviving him are his wife, a daughter, and a son.

William H. Miner

William Harlow Miner, president of Miner Rubber Co., Ltd., Granby, P.Q., Canada, died July 13 at the age of 81.

Mr. Miner, after having been graduated from McGill University, joined his uncle in Miner Rubber Co. He was a former president of Canadian Manufacturers Association and was one of the founders of Rubber Association of Canada (1920). He served for 29 years on the board of the latter and was president twice. In addition, he was a director of the Southern Canada Power Co. and president of the Granby Board of Trade for several years. The deceased was also very active in Granby's civic affairs and industrial development.

Funeral services were held from Granby United Church, July 16, and interment was in Pine Tree Cemetery.

He is survived by a son and two daughters.

Nathaniel S. Dodge

Nathaniel S. Dodge, founder and president of The American Rubber Mfg. Co., Oakland, Calif., died June 16 after a brief illness.

Born in Philadelphia, Pa., 86 years ago, Mr. Dodge had been active in the rubber industry for 72 years. He began his career in 1888 with the now-defunct Mineralized Rubber Co., New York, N. Y., and moved to Morgan & Wright Co., Chicago, Ill., four years later. In 1894 he went to San Francisco, Calif., where he was a representative for New York Belting & Packing Co. and Manhattan Rubber Co. He later formed Western Belting & Hose Co., with sales outlets in San Francisco and Los Angeles, Calif.

In 1906, Mr. Dodge founded the American Rubber Mfg. Co. and became its president. He produced and developed items to be used in gold mining, rock and gravel work, lumber, and canning, and he was one of the early manufacturers of high-grade fire hose.

The deceased belonged to the Engineers' Club of San Francisco, San Francisco Commercial Club, Commonwealth Club of California, Claremont Country Club (Oakland).

Mr. Dodge is survived by three daughters and a son.

Funeral services were held June 20 at the Albert Brown Chapel, Oakland.

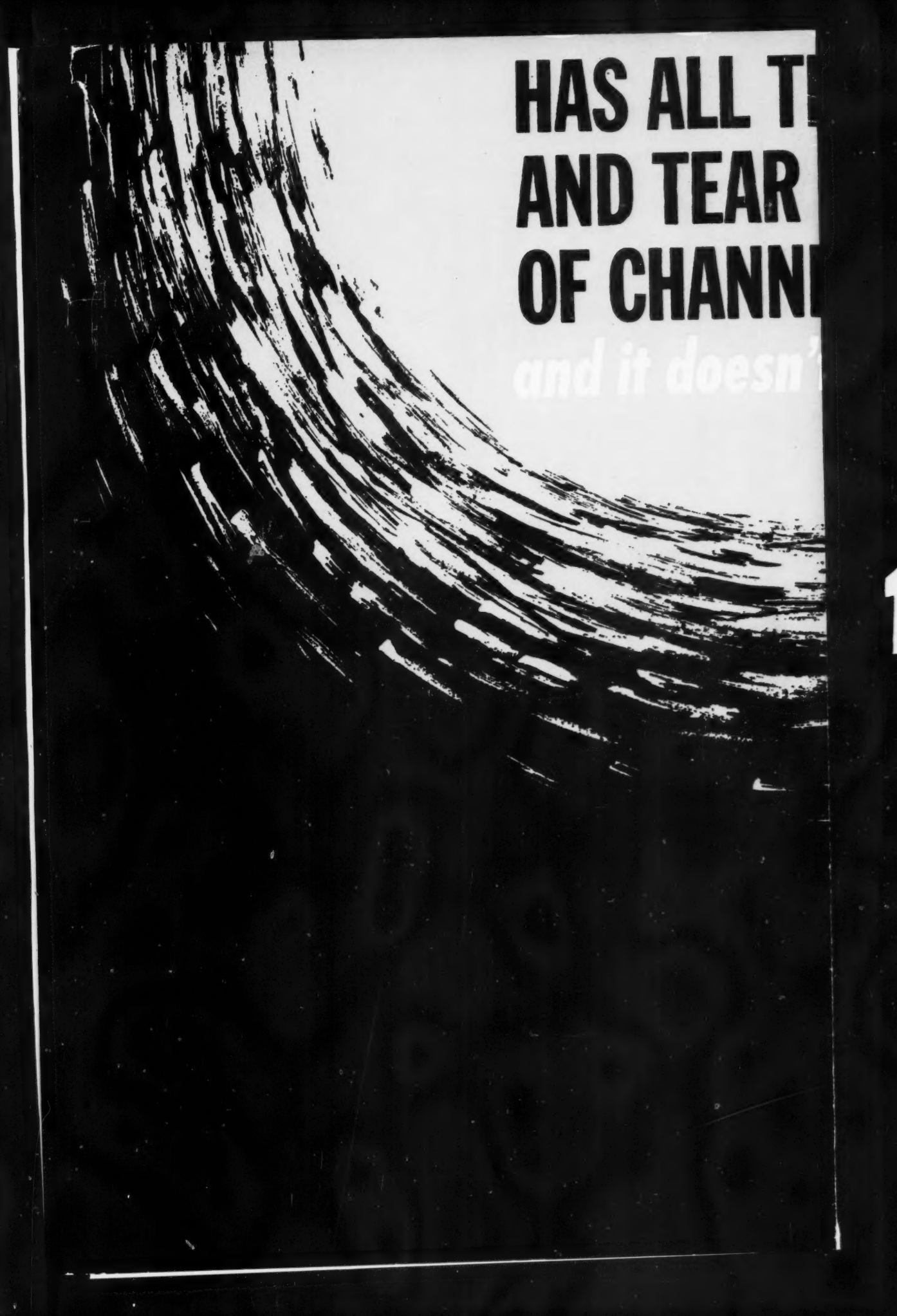
Charles J. Weber

Charles J. Weber, founder and former president of Duratile Co., Fremont, O., died August 27, at the age of 80, in Akron, O., after a long illness.

In addition to Duratile Co., Mr. Weber had served Swinehart Tire & Rubber Co., Chicago, Ill., as branch manager for 20 years. After his retirement from Duratile, he spent three years with General Tire & Rubber Co.

He is survived by his wife.

A Requiem Mass was said August 29 in St. Vincent Church, Akron.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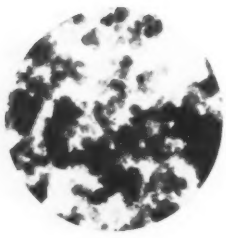

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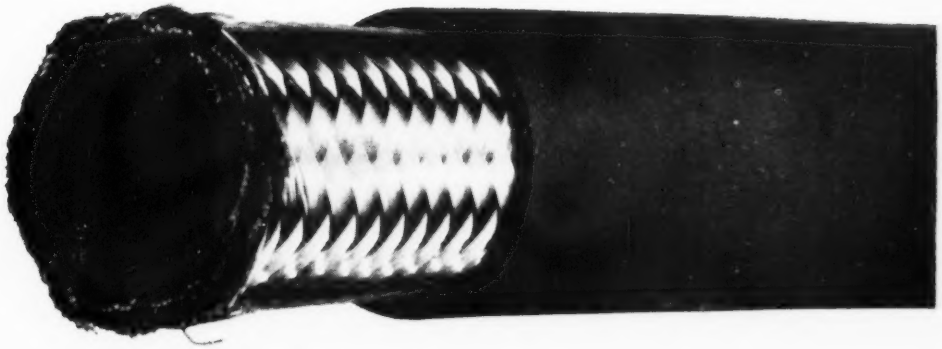
IN HIGH PRESSURE HOSES ➧



IN TIRE BEADS ➧

National-Standard engineers have developed ADPLY-A wire for use in a variety of rubber products to provide twice the adhesion properties of present wire finishes plus as-good-as, or better, corrosion protection.

ADPLY-A is high-carbon steel wire coated first with zinc for good corrosion protection and then with brass for good adhesion, and is less sensitive to variations in rubber composition. This combination of double coating provides longer storage life, increased adhesion and corrosion protection for such applications as rubber hose reinforcing (where corrosion is a problem), and for aircraft tires. In fine sizes for high-pressure hose, ADPLY-A fulfills the need for a less-expensive wire than stainless steel, but with greater corrosion protection than liquor finish wire.

COMPARISON OF ADPLY-A WITH OTHER WIRE FINISHES

	ADPLY-A Adhesion	ADPLY-A Corrosion Protection
AP-1	Better	Same
BP Finish	Better	Better
Brass Finish	Same	Better
Liquor Finish	Better	Better

*Trademark

For complete information on new ADPLY-A wire from National-Standard, write to National-Standard Company, Niles, Michigan.

NS NATIONAL STANDARD COMPANY

NATIONAL-STANDARD COMPANY

Niles, Michigan

market reviews

Natural Rubber

Natural rubber prices continued to decline during the July 16-August 15 period, rapidly during the first two weeks, and more slowly during the second half of the period.

Spot prices for Ribbed Smoked Sheet, which had dropped 5¢ between June 30 and July 15, fell another 4¢ in the last half of July. During the first two weeks of August prices fell only about a cent. Prices of the lower grades were less sensitive, falling only 2¢ during the July 16-August 15 period.

One reason advanced for the drop in spot prices was the stockpiling done by the major rubber manufacturers prior to recent union contract talks. Until the stockpiles are used up, demand is expected to be off.

On the New York Commodity Exchange, prices of September rubber were off about 3¢ during the period, reflecting similar drops on the Singapore and London markets. Both in London and New York the premium on spot and nearby rubber had all but disappeared. The New York futures market was very dull during the first half of August. Only 2,490 long tons of rubber were sold during the two weeks, the smallest amount for a two-week period since December, 1958.

Observers abroad commented that the drop in prices was long overdue, since prices of rubber had gone up or remained steady during the second quarter, while most other commodity prices were falling.

According to the United States Department of Commerce, total U. S. natural rubber consumption in June was 42,576 long tons, compared with 41,263 long tons in May. The 1960 six-month total was 265,452 long tons, against 277,295 long tons in the first half of 1959.

REX CONTRACT

1960	July 22	July 29	Aug. 5	Aug. 12
July	43.00	....	....	....
Sept.	36.57	37.26	36.75	36.85
Nov.	35.80	36.20	35.85	35.30
1961				
Jan.	35.50	35.75	35.30	35.00
Mar.	35.15	35.50	34.85	34.76
May	34.80	35.10	34.65	34.30
July	34.50	34.80	34.30	34.10
Sept.	....	34.50	34.10	33.85

July sales on the New York Commodity Exchange amounted to 15,350 long tons, compared with 12,710 long tons during June. There were 20 trading days in July, and 21 in the July 16-August 15 period.

NEW YORK OUTSIDE MARKET

1960	July 22	July 29	Aug. 5	Aug. 12
RSS #1	39.00	38.00	37.25	37.00
#2	38.50	37.75	37.00	36.75
#3	37.75	37.25	36.50	36.25
Pale Crepe				
#1 Thick	43.50	42.00	41.25	40.50
Thin	43.50	42.00	41.25	40.50
#3 Amber Blankets	34.25	34.25	33.50	32.75
#3 Thin Brown Crepe	34.37	34.25	33.50	33.00
Standard Flat Bark	28.25	28.13	27.50	26.50

On the physical market, according to The Rubber Trade Association of New York, RSS #1 averaged 40.91¢ a pound for July and 38.17¢ for the July 16-August 15 period. Average July sellers' prices for the representative grades were RSS #3, 39.83¢, Amber Blankets, 35.98¢, and Flat Bark, 29.41¢.

Synthetic Rubber

Consumption of new rubber in the United States for July was 115,070 long tons, contrasted with 138,425 long tons consumed in June, according to the monthly report of The Rubber Manufacturers Association, Inc. The drop in consumption was due to vacation shutdowns, the report said.

Production of synthetic rubber during July was 116,759 long tons, against 122,547 long tons produced in June.

Synthetic rubber consumption in July was 79,985 long tons, compared with 95,849 long tons in June. For the fourth straight month the ratio of synthetic rubber consumption to total new rubber consumption hit a new high, reaching 69.51%, against 69.24% in June. For the first seven months this year the ratio was 68.19%, compared with 65.35% for the same period in 1959.

Consumption (in long tons) by type in July was: SBR, 68,140, against 80,951 in June; CR, 5,010, against 7,129; IIR, 4,600, against 5,150; and NBR, 2,235, against 2,619.

Synthetic rubber exports for July totaled 91,114 long tons, compared with 93,862 long tons in June. Total stocks in July reached 237,161 long tons, contrasted with 226,032 long tons in June.

Black masterbatch production was 5,728 tons, against 3,404 in June; oil black masterbatch, 19,747 tons against 24,179; and oil masterbatch, 36,242 tons, against 36,616 tons in June.

Latex

The drum latex market was fairly quiet during the July 16-August 15 period, with some decline in prices. There were occasional spurts in buying encouraged by marking down of dry rubber values, and a moderate turnover for shipment during the last quarter of the year. The supply position for the nearer months is more or less in balance, but producers are rather poorly sold for forward shipment.

The bulk latex market is still quiet, but with signs of some slight improvement in the differential.

According to the Natural Rubber Bureau, June figures show a slight increase in the ratio of natural to synthetic latex consumption in the United States, 30.95%, compared with 29.66% in May. The six-month ratio, however, shows only 32.76% of latices consumed in the United States during the first six months of the year was natural latex, compared with 41.42% in the first half of 1959.

Shipments from Malaya in June totaled 9,906 tons, against 8,749 tons in May. The breakdown includes 2,267 tons shipped to the United Kingdom, 1,301 tons shipped to the United States, and 982 tons shipped to Japan, compared with 2,708, 1,582, and 913 tons, respectively, in May.

Prices for ASTM centrifuged concentrated natural latex, in tank-car quantities, f.o.b. rail tank car, ran about 42.29¢ per pound solids. Synthetic latices prices were 26 to 40.24¢ for SBR; 37 to 57¢ for CR, and 45 to 60¢ for NBR.

(All figures in long tons, dry weight)

Type of Latex	Production	Imports	Consumption	Month-End Stocks
Natural				
May	0	5,380	3,655	15,214
June	0	*	3,975	14,140
SBR				
May	8,162	——	6,821	10,031
June	7,541	——	7,147	9,142
Neoprene				
May	1,250	0	868	1,745
June	965	0	1,033	1,530
Nitrile				
May	1,009	0	978	2,342
June	973	0	981	1,941

*Not available yet for period covered.

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This independent test fleet is located in Devine, Texas, some thirty-two miles southwest of San Antonio on U S Hiway 81. Sponsors have a choice of three routes from which to choose. Test procedures are flexible. Tire rotation, cycle miles, number and frequency of reports or routing, can be a basis for discussion if the sponsor so desires. We endeavor to operate to the best advantage of the sponsor. Because we are wholly independent of any organization, all information collected is responsible to the sponsor only.

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Phone Morris 3-4428 **DEVINE, TEXAS** P. O. Box 35

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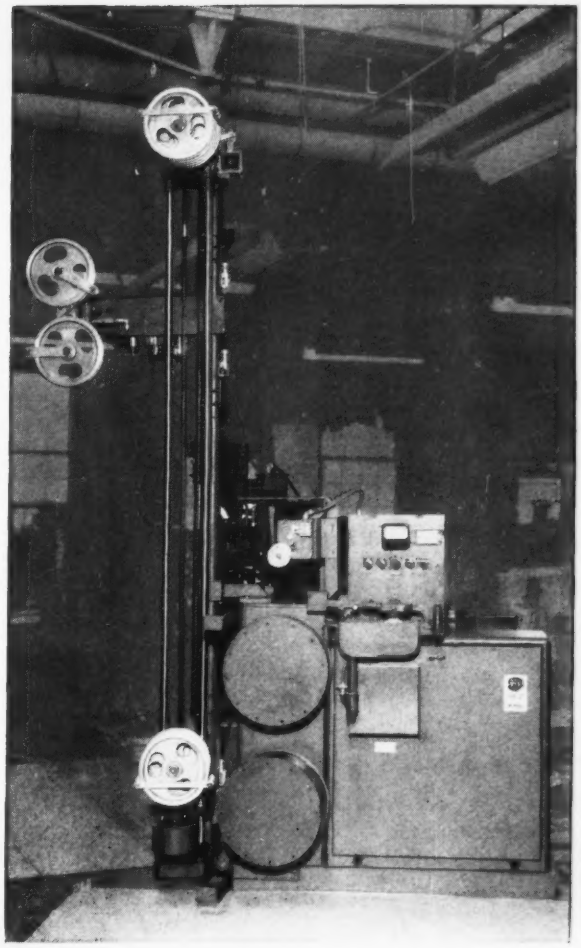

WIRE-IN-RUBBER

. . . problem solved

Since early 1930's, National-Standard has been the leader in the design and manufacture of tire bead equipment. Shown above is the latest in the continuing National-Standard product redesign and improvement program—the new Model PFB Pull-off and Festooner. This unit pulls wire from the let-off reels at a rate up to 1000 feet per minute through bead insulating heads, stores and continuously feeds the insulated wire to NS-designed bead machines. The new model features dual-speed control, new safety devices and a direct drive gear reducer, to improve efficiency and output for tire manufacturers.

This is another National-Standard contribution to the improvement of wire-in-rubber processing. Call National-Standard for help in solving your wire-in-rubber problems.

NS NATIONAL-STANDARD COMPANY

NATIONAL-STANDARD COMPANY
Niles, Michigan

Scrap Rubber

The scrap rubber market continued very slow during the July 16-August 15 period, with prices of both tires and tubes down somewhat from the beginning of the period. A pickup of business was expected around Labor Day, as reclaim plants resumed operations after their vacation shutdowns.

Prices of mixed tires at eastern points remained unchanged, ranging from $7 to $12, the high side applicable only on shipments to Buffalo. At Akron mixed auto tires were quoted at $11, down 50¢ from the previous period's price.

Prices of mixed auto tubes dropped from 5.75¢ to 5¢ in the East and in Akron, and black passenger tubes held steady, being quoted at 5.75¢ in the East and 5.50¢ in Akron. Synthetic butyl tubes dipped from 7.75¢ to 7.25¢ at both eastern and midwestern points.

	Eastern Points	Akron, O.
	Per Net Ton	
Mixed auto tires	$7.00/$12.00	$11.00
S.A.G. truck tires	nom.	nom.
Peeling, No. 1	nom.	33.00
2	nom.	nom.
3	nom.	nom.
	(¢ per Lb.)	
Auto tubes, mixed	5.00	5.00
Black	5.75	5.50
Red	nom.	nom.
Butyl	7.25	7.25

Reclaimed Rubber

The reclaimed rubber market was very quiet during the July 16-August 15 period, owing to vacation shutdowns both in the reclaim plants and in plants of users.

A Midwest reclaim manufacturer indicated that with automobile manufacturers in process of changing models, no pickup in business was expected until after September 1.

Shipments for the period were off about 15% from those of the June 16-July 15 period, and shipments for the third quarter as a whole are expected to be off about 6% from those of the second quarter, an eastern reclaim manufacturer predicted.

More significantly, since third-quarter business is normally slow, another eastern reclaimer noted that business for the July 16-August 15 period is off about 18% from that of the same period last year.

"Considering the decline in industry in general, this is to be expected," the reclaimer commented, adding, "We still feel that the trend will reverse itself before the year's end."

According to The Rubber Manufacturers Association, Inc., reclaimed rubber consumption for July was 19,380 long tons, against 24,677 long tons in June. Production was 21,625 long tons, compared with 25,429 in June. No reclaim was imported in July, but 1,165 long tons were exported, just one ton more than was exported in June.

RECLAIMED RUBBER PRICES

Whole tire, first line	$0.115
Third line	.1075
Inner tube, black	.17
Red	.22
Butyl	.17
Light carcass	.22
Mechanical, light-colored, medium gravity	.185
Black, medium gravity	.10

The above list includes those items or classes only that determine the price basis of all derivative reclaim grades. Every manufacturer produces a variety of special reclaims, in each general group separately featuring characteristic properties of quality, workability, and specific gravity, at special prices.

Industrial Fabrics

The market continued extremely spotty for industrial grey cotton goods during the July 16-August 15 period. Although most buyer stocks are judged to be quite low, as indicated by a fair number of relatively small-quantity orders, there was no indication of any general entry by buyers into the market in the near future.

Although quoted prices on first-quality goods remain unchanged, for some months there has been a drift by many buyers to the use of tinged, discolored cotton. Buyers are interested in saving from 1-3¢ a pound or more on off-grade cloth if tensile strength is not lost, since their customers seek such savings for economy reasons.

Industrial Fabrics

Drills*

59-inch, 1.85, 68x40	*yd.*	$0.395
2.25, 68x40		.335

Broken Twills*

54-inch, 1.14, 72x52	*yd.*	.585
58-inch, 1.06, 72x52		.63

Osnaburgs*

59-inch, 2.35, 32x26	.295
61-inch, 2.20, 38x28	.305
62-inch, 2.23, 32x26	.30

Ducks

Numbered Duck†

List less 45%

Enameling Ducks*

	S.F.	D.F.
38-inch, 2.00 yd.	$0.275	.33
51.5-inch, 1.35 yd.	.4738	.4888
57-inch, 1.22 yd.	.4838	.50
72-inch, 1.05 yd.	.6575	.6765

Hose and Belting Ducks*

Basis	*lb.*	.67

Chafer Fabrics*

14.40-oz/sq.yd. P.L.	*lb.*	.74
11.65-oz./sq.yd. S.Y.		.65
10.80-oz./sq.yd. S.Y.		.68
8.9-oz./sq.yd. S.Y.		.70

* Net 10 days.
† 2% 10 days.

Sheeting*

52-inch, 3.85, 48x48	*yd.*	$0.24
57-inch, 3.47, 48x48		.245
60-inch, 2.10, 64x64		.38
2.40, 56x56		.34

Sateens*

53-inch, 1.12, 96x60	*yd.*	.6275
1.32, 96x64		.56
58-inch, 1.02, 96x60		.68
1.21, 96x64		.61

Rayon and Nylon

The price war between rayon and nylon makers of tire cord continued during the July 16-August 15 period, with the third round of price cuts during the past 12 months.

Unlike the previous cuts, this one was touched off by the rayon manufacturers. Beaunit Mills, Inc., Industrial Rayon, and American Viscose Corp. announced during the first week of August that they were reducing prices of Tyrex viscose tire yarns 2½¢ a pound for the month of August alone. Before the week was out, however, Beaunit announced that the new price would continue past August, and other rayon manufacturers said they would follow suit.

This move brought the prices of 1100 denier yarn to 54½¢ a pound, and 1650 denier yarn to 47½¢ a pound.

Following the second Beaunit announcement, E. I. du Pont de Nemours & Co., Inc., immediately posted reductions of 2-5¢ a pound for high-tenacity nylon tire yarn, and Chemstrand Corp. and Allied Chemical Corp., two of the other major producers, immediately did likewise. This action brought the price of 840 denier yarn, equivalent of the 1650 denier rayon yarn, to 92¢.

Since last August, when the first price cuts were made by nylon manufacturers, the price of 1100 denier rayon yarn has dropped from 66¢, and the price of nylon 840 denier yarn has dropped from $1.20.

This third cut was reportedly brought on by intense competition among rayon producers themselves, formalizing a situation in which posted prices, particularly for export, were reportedly being shaved. Rayon sales for the first quarter of 1960 were off more than 10%, compared to sales for the like period last year, it was reported. This situation still left the year's production expected to be more than 300 million pounds, close to the industry's capacity of 340 million pounds.

Total packaged production of rayon and acetate filament yarn during July was 53.2 million pounds, including 22.5 million pounds of high-tenacity yarn and 30.7 million pounds of regular-tenacity.

June production was 56.2 million pounds of yarn, including 23.6 million pounds of high-tenacity yarn and 32.6 million pounds of regular-tenacity.

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WIRE-IN-RUBBER

. . . problem solved

The hexagonal bead in the photo above is a new type of tire bead developed for use in single wire-ply tires where conventional square beads are not practical. Hexagonal bead grommets are already in metal-ply bus and truck tires now on road tests and under development.

The design and manufacture of a special bead-winding machine for producing a variety of bead-grommet cross sections is another National-Standard contribution to the rubber industry. It is typical of the many solutions to wire-in-rubber problems that have come from National-Standard engineers for over 50 years. Call National-Standard for help in solving your wire-in-rubber problems.

NS NATIONAL-STANDARD COMPANY

NATIONAL-STANDARD COMPANY
Niles, Michigan

accuracy is no accident

Here are some of the reasons Bolling construction reduces molding costs — increases accurate production.

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Speed Reducers • Gears • Extruders

Filament stocks at the end of July were 62.9 million pounds, including 19.8 million pounds of high-tenacity yarn and 43.1 million pounds of regular-tenacity.

June stocks totaled 58.5 million pounds, including 19.6 million pounds of high-tenacity yarn and 38.9 million pounds of regular-tenacity.

Shipments of filament reached 45.9 million pounds during July, including 19.9 million pounds of high-tenacity yarn and 26 million pounds of regular-tenacity. These figures compare with 59.6 million pounds in June, including 21.5 million pounds of high-tenacity yarn and 38.1 million pounds of regular tenacity.

RAYON PRICES

Tire Fabrics

1100/490/2	$0.69
1650/908/2	$0.58/.615

Tire Yarns

High-Tenacity	
1100/ 490	.535
1100/ 980	.545
1150/ 490, 980	.535
1230/ 490	.535
1650/ 980	.465
1875/ 980	.465/.475
2200/ 980	.455
Super-High Tenacity	
1650/ 720	.475/.565

NYLON PRICES

Tire Yarns

840/140	.92/ .94
1680/280	.89/ .92

Brazil Ups Rubber Use

Brazil's rubber manufacturing industry used 61,023 metric tons of rubber (dry weight) in 1959, against 53,474 tons in 1958, statistics issued by the Executive Committee for the Protection of Rubber show. Included in the 1959 figures were 42,963 tons of natural rubber, 1,207 tons natural latex, 8,966 tons of synthetic rubber, 424 tons of synthetic latices, and 7,463 tons of reclaim. These amounts compare with 41,680 tons of natural rubber, 1,276 tons of natural latex, 1,455 tons of synthetic rubber, 433 tons of synthetic latices, and 8,630 tons of reclaim, in 1958. In both years about 45% of the natural rubber consisted of imports. The rise in consumption was almost entirely covered by synthetic rubber. Last year nearly three-quarters of the natural rubber (30,205 tons) and over two-thirds of the synthetic rubber (6,199 tons) went into the manufacture of automotive tires. Altogether 2,748,214 motor tires were made last year, or 28% more than the 1958 total of 2,148,214 units. The 1959 amounts included 1,047,107 truck and bus tires and 1,405,252 passenger-car tires.

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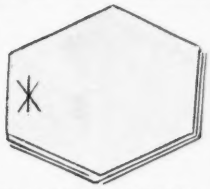

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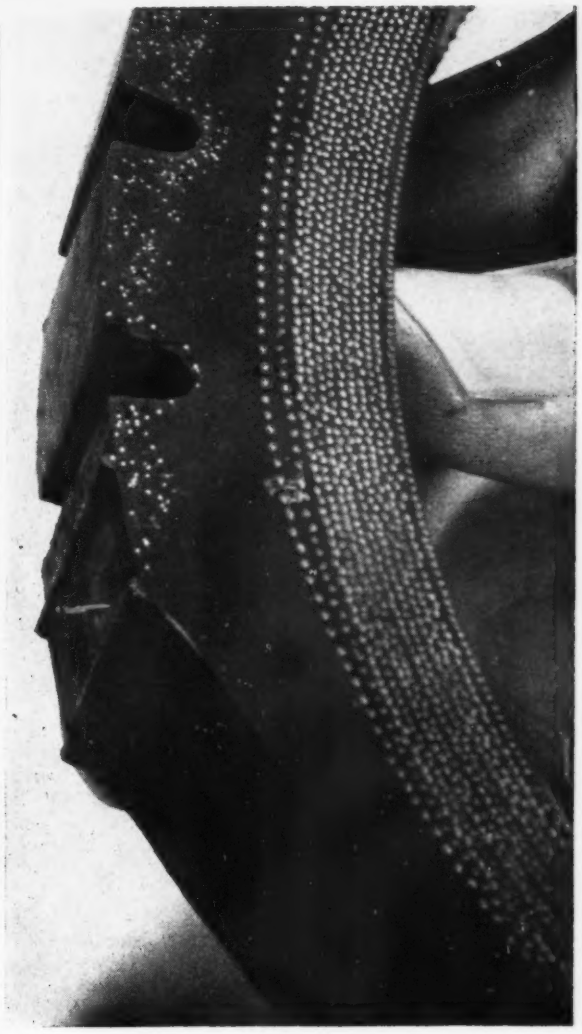

WIRE-IN-RUBBER

. . . problem solved

In the cross section of tire tread shown above, you see hundreds of tiny pieces of .006″ brass-plated, high-tensile, high-carbon steel wire. Cut to accurately measured lengths, the wire is molded into tire treads for added traction, better heat and static dissipation and longer life, for such applications as aircraft tires and other critical tire applications. The testing and manufacture of brass-plated, high-tensile wire with proper adhesion and strength was a National-Standard engineering contribution to the rubber industry. It is typical of the many National-Standard wire-in-rubber problem solutions. Call National-Standard for help in solving your wire-in-rubber problems.

NS NATIONAL-STANDARD COMPANY

NATIONAL-STANDARD COMPANY

Niles, Michigan

Synthetic Rubbers and Latices*

Monomers

11-80, 100, 200, 112-3 Triols	lb.	$0.255	
11-300	lb.	.265	
-400	lb.	.325	
Acrylonitrile	lb.	.27	
Butadiene	lb.	.15	
Dow Styrene	lb.	.12	
H99, N99	lb.	.205	
RG	lb.	.17	
Vinyltoluene	lb.	.17	
Hylene M	lb.	1.25	/ $2.75
M-50	lb.	.86	/ 2.36
T	lb.	.85	/ 2.41
TM	lb.	.70	/ 2.26
-65	lb.	.75	/ 2.31
Isobutylene	gal.	.38	
Isoprene	lb.	.25	
Mondur-C	lb.	1.05	
Multron R-2	lb.	.54	
P200	lb.	.23	
Rohm & Haas ethyl acrylate	lb.	.34	/ .36
Glacial methacrylic acid	lb.	.40	/ .425
Methyl acrylate	lb.	.37	/ .39
Methacrylate	lb.	.29	/ .31

Shortstops

4P Mercaptan	lb.	.27	/ .31
DDM	lb.	.94	/ .975
Mercaptan 174	lb.	.38	/ .50
Sharstop 204	lb.	.38	/ .42
268	lb.	.52	/ .53
Tecquinol	lb.	.825	/ .845
Thiostop K	lb.	.50	/ .53
N	lb.	.38	/ .47
Vulnapol KM	lb.	.52	/ .56
NM	lb.	.38	/ .42
Wingstop B	lb.	.38	

Acrylic Types

Acrylon BA-15	lb.		1.25[a]
EA-5	lb.		1.00[a]
Hycar 4021	lb.	1.34[e]	/ 1.35[e]

Latices

Hycar 2600X30, 2600X39, 2601	lb.	.50	/ .56

Butadiene Types (BR†)

Cis-1	lb.	.35[b]	/ .50[b]

Cold BR Latex

Pliolite Latex 2104	.325

Fluorocarbon Types

Fluorel KF-2141	lb.	10.00	/ 10.25
Kel-F Elastomer	lb.	15.00	/ 16.00
5500, 820 (Latex)	lb.	15.00	/ 17.15
Viton A, AHV	lb.	10.00	/ 10.25
B	lb.	13.00	

Isobutylene Types (IIR)

Enjay Butyl 035, 065, 150, 215, 217, 218, 325			.23[a]
165, 268, 365			.24[a]
Hycar 2202		.65[e]	/ .75[e]
Polysar Butyl 100, 200, 300 400			.245[e]
101			.2775[a]
301			.255[e]
Vistanex LM			.45[a]
MM			.35[a]

Neoprene Types (CR)

Neoprene Type AC, AD, CG	.55[a]	/	.575[a]
FB	.65[a]	/	.675[a]
GN, GN-A, WB, WX	.41[a]	/	.435[a]
GRT, S	.42[a]	/	.445[a]
KNR	.75[a]	/	.775[a]
W, WHV	.30[a]	/	.415[a]
WD	.45	/	.475
W-M1	.40[a]	/	.415[a]
WRT	.45[a]	/	.475[a]

Latices

Neoprene Latex 571, 842-A	.37[a]	/	.47[a]
572	.39[a]	/	.49[a]
60, 601-A	.40[a]	/	.50[a]
635	.41[a]	/	.51[a]
400, 650	.42[a]	/	.52[a]
735, 736	.38[a]	/	.48[a]
750	.39[a]	/	.49[a]
950	.47[a]	/	.57[a]

Nitrile Types (NBR)

Butaprene NF	.49[b]
NH	.65[b]
NL	.50[b]
NXM	.58[b]
Chemigum, N1NS	.64[b]
N3NS, N5	.58[b]
N6, N-6B, N7, N8	.50[b]
N600	.50[b]

Hycar 1001, 1041	$0.58[e]	/	$0.59[a]
1002, 1042, 1043, 1052, 1053, 1312	.50[e]	/	.51[e]
1014	.60[e]	/	.61[e]
1072	.64[e]	/	.65[e]
1411	.62[e]	/	.63[e]
1432, 1441	.59[e]	/	.60[e]
Paracril, AJ	.485[e]	/	.495[e]
B, BJ, BJLT, BLT	.50[e]	/	.51[e]
C, CLT	.58[e]	/	.59[e]
CV	.63[e]	/	.64[e]
D	.65[e]	/	.66[e]
OZO	.46[e]	/	.47[e]
18-80	.60[e]	/	.61[e]
Polysar Krynac 800, 802, 803			.50[e]
801			.58[e]

Latices

Butaprene N-300	.46[b]
N-400, N-401	.54[b]
Chemigum 200	.40[b]
235 CHS, 236	.54[b]
245 B, 245 CHS, 246, 247, 248	.46[b]
Hycar 1512, 1552, 1562, 1577	.45[e] / .52[e]
1551, 1561, 1571	.53[e] / .60[e]
1852	.46[e] / .52[e]
Nitrex 2612	.45[a] / .52[a]
2616	.53[a] / .60[a]
2619	.52[a] / .59[a]
2620, 2625	.45[a] / .52[a]
Tylac 640	.45[e] / .52[e]
740	.49[e] / .56[e]
840	.53[e] / .60[e]
1640	.54[e] / .61[e]

Polyethylene Type

Hypalon 20	lb.	.4975
30	lb.	.6275
40	lb.	1.5275

Polysulfide Types

Thiokol LP-2, -3, -31, -32, -33	.96[a]
-8	1.35[a]
-205	4.00[a]
Type-A	.50[a]
FA	.69[a]
ST	1.25[a]

Latices

Thiokol Latex (dry wt.) Type MX			.80[a]
WD-2			1.25[a]
-6	.80[a]	/	1.25[a]

Silicone Types

GE (compounded)	2.29[e]	/	4.90[e]
Silicone gum	3.85[e]	/	4.55[e]
Silastic (compounded)	2.95[b]	/	3.50[b]
(Partly compounded)	3.15[b]	/	3.60[b]
(Uncompounded)	4.05[b]	/	4.35[b]
LS-53	12.00	/	16.30
Union Carbide (compounds)	2.35[b]	/	3.20[b]
(Gums)	3.85[b]	/	4.25[b]

Styrene Types (SBR)‡

Hot SBR

Ameripol 1000, 1001, 1006, 1007	.24[e]	/	.247[e]
1002	.2335[e]/		.2495[e]
1006 Crumb	.2475[e]/		.2535[e]
1009	.2475[e]/		.2535[e]
Crumb	.259[e]	/	.265[e]
1011	.2475[e]/		.2535[e]
1012	.2425[e]/		.2485[e]
Crumb	.249[e]	/	.255[e]
1013	.241[e]	/	.247[e]
Crumb	.2615[e]/		.2675[e]
ASRC 1004, 1006	.241[e]	/	.2475[e]
1009	.2475[e]/		.2535[e]
1018	.27[e]	/	.276[e]
1019	.265[e]	/	.271[e]
Copo 1006	.241[e]	/	.247[e]
FR-S 1000, 1001, 1004, 1006	.241[e]	/	.247[e]
1007	.241[e]	/	.247[e]
1009	.2475[e]/		.2535[e]
1010	.26[e]	/	.266[e]
1012	.2425[e]/		.2485[e]
1013	.241[e]	/	.247[e]
Crumb	.2615[e]/		.2675[e]
1014	.281[e]	/	.287[e]
141	.28[e]	/	.286[e]
181	.241[e]	/	.247[e]
Naugapol 1016, 1019	.265[b]	/	.27[b]
1018	.27[b]	/	.275[b]
1021	.30[b]	/	.305[b]
1022	.295[b]	/	.30[b]
1023	.315[b]	/	.32[b]
6003	.27[b]	/	.275[b]
Philprene 1000, 1001, 1006, 6701	.241[b]	/	.247[b]
1009	.2475[b]/		.2535[b]
1018	.27[b]	/	.276[b]
1019	.265[b]	/	.271[b]
Plioflex 1006	.241[e]	/	.247[e]
Polysar S-630	.241[e]	/	.247[e]
S-X-371	.255[e]	/	.261[e]
S-1000, -1006, -1013			.23[a]
-1002, -1011			.2325[a]
-1009			.24[a]
Synpol 1000, 1001, 1006, 1007, 1013, 1061	.241[b]	/	.247[b]
1002	.2435[b]/		.2495[b]
1012	.2425[b]/		.2485[b]
1009	.2475[b]/		.2535
8000	.241[b]	/	.247[b]
X-274	.255[e]	/	.261[e]

Hot SBR Black Masterbatch

Philprene 1100	$0.194
1104	.190[b]
S-1100	.185[a]

Hot SBR Latices

Copo 2000			.2775[e]
FR-S 2000, 2001	$0.2725[e]/		.3425[e]
2002	.35[e]	/	.36[e]
2003, 2004	.305[e]	/	.36[e]
2006	.29[e]	/	.382[e]
Naugatex 2000, 2001	.2775[e]/		.3575[e]
2002	.30[e]	/	.37[e]
2006	.29[e]	/	.42[e]
Pliolite Latex 2000, 2001			.2825
2076			.295[e]
Polysar Latex II			.29[e]
IV			.2775
S-2000, 2006			.26[a]

Cold SBR

Ameripol 1500, 1501, 1502, 4600	.241[e]	/	.247[e]
ASRC 1500, 1502	.241[e]	/	.247[e]
1503	.2625[e]/		.2685[e]
3105, 3106	.241[e]	/	.247[e]
3110	.26[e]	/	.266[e]
C-102			.23[a]
Copo 1500, 1502, 1507	.241[e]	/	.247[e]
1505-NS	.261[e]	/	.267[e]
FR-S 1500, 1502, 146, 179	.241[e]	/	.247[e]
127	.26[e]	/	.266[e]
Gentro 1500			.241
Naugapol 1503	.2625[b]/		.2675[b]
1504	.33[b]	/	.335[b]
6100	.31[b]	/	.315[b]
Philprene 1500, 1502	.241[b]	/	.247[b]
1503	.2625[b]/		.2685[b]
Plioflex 1500C, 1502, 1507, 1510	.241[e]	/	.247[e]
Polysar Kryflex 200			.251[e]
252			.27[e]
Krylene NS			.241[a]
SS-250, SS-250-Flake			.2875[e]
S-1500, S-1502			.23[a]
1509			.23[a]
Synopol 1500, 1502, 1551, 8103	.241[b]	/	.247[b]

Cold SBR Black Masterbatch

Ameripol 1605	.19[e]	/	.196[e]
4651	.177[e]	/	.183[e]
4659	.182[e]	/	.188[e]
4660	.187[e]	/	.193[e]
Baytown 1600, 1601, 1602			.193[b]
Carbomix 3750	.182[e]	/	.188[e]
3752	.1845[e]/		.1905[e]
3756	.1569[e]/		.1629[e]
CB-102			.185[a]
Gentro-Jet 9152			.208
9153			.182
9154			.1845
Philprene 1601	.193[b]	/	.199[b]
1603	.196[b]	/	.202[b]
1605	.19[b]	/	.196[b]
S-1600, -1602			.1825[e]
-1605			.18[a]
S-1600, -1602, -1604			.1825[e]
-1605			.18[a]
-1606, -1607			.175[a]
-7652			.1875[e]
OB-116			.181[e]
Synpol 8151	.182[b]	/	.188[b]
8152	.186[b]	/	.192[b]

Cold SBR Oil Masterbatch

Ameripol 1705	.2035[e]/		.2095[e]
1707, 1708	.191[e]	/	.197[e]
1710, 1712	.1885[e]/		.1945[e]
4700	.175[e]	/	.181[e]
4701	.1725[e]/		.1785[e]
ASCR 1703	.206[e]	/	.212[e]
1708	.191[e]	/	.197[e]
1712	.1885[e]/		.1945[e]
1713	.175[e]	/	.181[e]
Copo 1712	.1885[e]/		.1945[e]
1713	.175[e]	/	.181[e]
1714	.1725[e]/		.1785[e]
1773	.206[e]	/	.212[e]
1778	.191[e]	/	.197[e]
FR-S 1703	.206[e]	/	.212[e]
1710	.1885[e]/		.1945[e]
1712	.1885[e]/		.1945[e]
123	.196[e]	/	.202[e]
154, 155	.1885[e]/		.1945[e]
173	.206[e]	/	.212[e]
178	.191[e]	/	.197[e]
Gentro 1712			.1885
Philprene 1703	.206[b]	/	.212[b]
1708	.191[b]	/	.197[b]
1712	.1885[b]/		.1945[b]
Plioflex 1703, 1773	.206[e]	/	.212[e]
1710C, 1712C	.1885[e]/		.1945[e]
1713	.175[e]	/	.181[e]
1714C	.1725[e]/		.1785[e]
1773	.206[e]	/	.212[e]
1778	.191[e]	/	.197[e]
Polysar Krynol 651			.1885[e]
652			.191[e]
S-1703			.195[e]
-1707			.18[a]
-1709, -1710, -1712			.1775[a]
-1778			.18[a]
Synpol 1703	.206[b]	/	.212[b]
1707, 1708	.191[b]	/	.197[b]
1712	.1885[b]/		.1945[b]

(Continued on page 142)

[a] Freight extra.
[b] Minimum freight allowed.
[e] Freight prepaid.
* Prices are per pound carload of tank-car dry weight unless otherwise specified.
† BR—Butadiene rubber.
‡ SBR—Styrene-butadiene rubber.

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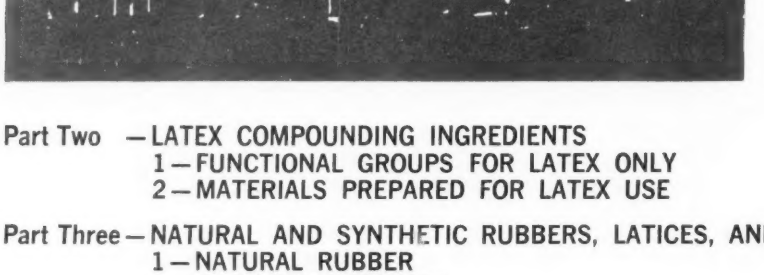

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Compounding Ingredients*

Abrasives

Pumicestone, powdered	lb.	$0.0363 /	$0.065
Rottenstone, domestic	lb.	.03 /	.04
Shelblast	ton	80.00 /	165.00
Walnut Shell Grits	ton	50.00 /	160.00

Accelerators

A-1 (Thiocarbanilide)	ton	.74 /	.81
A-32	ton	.66 /	.80
A-100	lb.	.52 /	.66
Accelerator B	lb.	.92	
49	lb.	.59 /	.60
52	lb.	1.14	
57, 62, 67, 77	lb.	1.04	
66	lb.	4.25	
89	lb.	1.20	
108	lb.	.92	
552	lb.	2.25	
808	lb.	.66 /	.68
833	lb.	1.17 /	1.19
Altax	lb.	.54 /	.56
Amax	lb.	.75 /	.77
No. 1	lb.	.71 /	.73
Arazate	lb.	2.25	
Beutene	lb.	.66 /	.68
Bismate	lb.	3.00	
B-J-F	lb.	.27 /	.32
Butazate	lb.	1.04	
Butyl Eight	lb.	1.10 /	1.35
Namate	lb.	.45 /	.50
Zimate	lb.	1.04	
Ziram	lb.	.89 /	1.04
Captax	lb.	.44 /	.46
Conac S	lb.	.76 /	.78
C-P-B	lb.	1.95	
Cumate	lb.	1.45	
Cydac	lb.	.71 /	.73
Cyuram DS, powder	lb.	1.14	
Pellets	lb.	1.14	
MS, powder	lb.	1.14	
Pellets	lb.	1.14	
Cyzate B, E	lb.	.87 /	.89
Delac-S	lb.	.71 /	.73
DIBS	lb.	.85 /	.87
Dipac	lb.	.85	
DOTG (diorthotolylguanidine)			
Cyanamid	lb.	.69 /	.70
Du Pont	lb.	.69 /	.70
DPG (diphenylguanidine)			
Cyanamid	lb.	.50 /	.52
Monsanto	lb.	.51 /	.57
El-Sixty	lb.	.62 /	.64
Ethazate	lb.	1.04	
50-D	lb.	.87 /	.89
Ethyl Seleram	lb.	3.00	
Thiurad	lb.	1.04	
Thiuram	lb.	1.04	
Tuads	lb.	1.04	
Tuex	lb.	1.04	
Zimate	lb.	1.04	
Ziram	lb.	.89 /	1.04
Ethylac #650	lb.	.93 /	.95
Guantal	lb.	.62 /	.64
Hepteen Base	lb.	1.85	
Ledate	lb.	1.04	
MBT (2-mercaptobenzothiazole)			
American Cyanamid	lb.	.44 /	.46
Du Pont	lb.	.44 /	.46
Naugatuck	lb.	.44 /	.49
-XXX, Cyanamid	lb.	.55 /	.57
MBTS (mercaptobenzothiazyl disulfide)			
Cyanamid	lb.	.54 /	.56
Du Pont	lb.	.54 /	.56
Naugatuck	lb.	.54 /	.56
-W Cyanamid	lb.	.59 /	.61
Merac #225	lb.	.75 /	1.05
Mertax	lb.	.55 /	.57
Methazate	lb.	1.04	
Methyl Thiuram	lb.	1.14	
Tuads	lb.	1.14	
Zimate	lb.	1.04	
Monex	lb.	1.14	
Mono-Thiurad	lb.	1.14	
2-MT (2-mercaptothiazoline)			
Cyanamid	lb.	.88 /	.90
Du Pont	lb.	1.00	
NA-22	lb.	1.05	
NOBS No. 1	lb.	.71 /	.73
Special	lb.	.75 /	.77
O-X-A-F	lb.	.55 /	.57
Pennac SDB	lb.	.45 /	.48
Pentex	lb.	1.24	
Flour	lb.	.30	
Permalux	lb.	2.25	
Phenex	lb.	.52 /	.59
Pip-Pip		2.07	
Polyac Pellets	lb.	1.85	
R-2 Crystals	lb.	4.35	
Rotax	lb.	.55 /	.57
RZ-50, -50B	lb.	1.00	
S.A. 52	lb.	1.14	
57, 62, 67, 77	lb.	1.04	
66	lb.	3.00	
Santocure	lb.	.71 /	.73
NS	lb.	.71 /	.73
Selenacs	lb.	3.00	
SPDX-GH	lb.	.69 /	.74
GL	lb.	1.20 /	1.34
Sulfads	lb.	1.98	
Tellurac	lb.	1.30 /	1.55
Tepidone	lb.	$0.45	
Tetrone A	lb.	1.98	
Thiates	lb.	.88 /	$1.25
Thiofide	lb.	.54 /	.56
Thionex	lb.	1.14	
Thiotax	lb.	.44 /	.46
Thiurad	lb.	1.14	
Thiuram E	lb.	1.04	
M	lb.	1.14	
Trimene	lb.	.56 /	.58
Base	lb.	1.03 /	1.06
Tuex	lb.	1.14	
Ultex	lb.	1.00 /	1.10
Unads	lb.	1.14	
Ureka Base	lb.	.66 /	.73
Vulcacure NB	lb.	.45	
NS	lb.	.75 /	1.05
T.M.D.	lb.	1.14	
ZB, ZE, ZM	lb.	.85 /	.89
Z-B-X	lb.	2.45	
Zenite	lb.	.54 /	.56
A	lb.	.69 /	.71
AM	lb.	.76 /	.78
Special	lb.	.55 /	.57
Zetax	lb.	.55 /	.57
Zimate	lb.	1.04	
ZMBT	lb.	.85 /	.57

Accelerator-Activators, Inorganic

Lime, hydrated	ton	21.96	
Litharge, comml.	lb.	.1425 /	1575
Eagle, sublimed	lb.	.1525	
National Lead, sublimed	lb.	.1585	
Red lead, comml.	lb.	.185 /	.195
Eagle	lb.	.1575	
National Lead	lb.	.1625 /	.1645
PRD-90	lb.	.38 /	.50
White lead, carbonate	lb.	.19 /	.20
Eagle	lb.	.17 /	.18
National Lead	lb.	.18 /	.19
Silicate	lb.	.1725 /	1825
Eagle	lb.	.1485	
National Lead	lb.	.165 /	.175
Zinc oxide, comml.†	lb.	.145 /	.155

Accelerator-Activators, Organic

Aktone	lb.	.2125 /	.2325
Barak	lb.	.65	
Capital 170	lb.	.20 /	.25
171	lb.	.1425 /	1925
225, 258, 710	lb.	.14 /	.19
261	lb.	.155 /	.18
262	lb.	.16 /	.185
263	lb.	.1775 /	.2025
270	lb.	.1175 /	.1425
Curade	lb.	.57 /	.59
D-B-A	lb.	1.05	
Emery 600	lb.	.1325 /	1825
G-M-F	lb.	2.60 /	2.65
PDD-70	lb.	2.70 /	3.00
PGD-25	lb.	1.25 /	1.50
Groco 30	lb.	.1325 /	.1825
Guantal	lb.	.62 /	.64
Hyfac 410	lb.	.1425 /	1675
430	lb.	.18 /	.205
431	lb.	.2025 /	.2275
Hystrene S-97	lb.	.1863 /	.2125
T-45	lb.	.1638 /	.19
T-70	lb.	.1738 /	.20
Industrene B	lb.	.1263 /	.1525
R	lb.	.1138 /	.14
158	lb.	.1313 /	.1575
254	lb.	.1413 /	.1675
262	lb.	.1513 /	.1775
Laurex	lb.	.37 /	.39
MODX	lb.	.295 /	.345
NA-22	lb.	1.05	
PND-70	lb.	1.35 /	1.60
Oleic acid, comml.	lb.	.185 /	.225
Emersol 210 Elaine	lb.	.1375 /	1875
Groco 2, 4, 8, 18	lb.	.1375 /	1875
Welcoline	lb.	.21 /	.42
Plastone	lb.	.27 /	.30
Polyac	lb.	1.85	
Ridacto	lb.	.25 /	.26
Seedine	lb.	.1485 /	.1703
Stearex Beads	lb.	.1488 /	.1588
Stearic acid			
Emersol 120	lb.	.1575 /	.1825
150	lb.	.185 /	.21
Hydrofoil 51	lb.	.09	
Hydrogenated, rubber grd.			
Groco 56	lb.	.115 /	.14
Rufat 75	lb.	.1062 /	.1325
Single pressed, comml.	lb.	.1475 /	.1675
Emersol 110	lb.	.1525 /	.1775
Groco 53	lb.	.1525 /	.1775
Wilmar 253	lb.	.1525 /	.1775
Double pressed, comml.	lb.	.1525 /	.1725
Groco 54	lb.	.1575 /	.1825
Wilmar 254	lb.	.1575 /	.1825
Triple pressed, comml.	lb.	.175 /	.195
Groco 55	lb.	.175 /	.20
Wilmar 255	lb.	.1875 /	.2075
Sterene 60-R	lb.	.09 /	.1075
Tonox	lb.	.54 /	.56
Vimbra	lb.	.32 /	.385
Vulklor	lb.	.88 /	.98
Wilmar 110	lb.	.17 /	.22
434	lb.	.1425 /	.1925
Zinc stearate, comml.	lb.	.39 /	.44

Antioxidants

AgeRite Alba	lb.	$2.40 /	$2.50
Gel	lb.	.70 /	.72
H. P.	lb.	.79 /	.81
Hipar	lb.	1.05 /	1.07
Powder	lb.	.57 /	.59
Resin	lb.	.88 /	.90
D	lb.	.57 /	.59
Spar	lb.	.57 /	.59
Stalite	lb.	.57 /	.59
S	lb.	.57 /	.59
Superlite	lb.	.57 /	.59
White	lb.	1.50 /	1.60
Akroflex C	lb.	.85 /	.87
CD	lb.	.79 /	.81
Alhasan	lb.	.69 /	.73
Alcogard 354 Powder	lb.	1.50 /	1.52
Allied AA 1144	lb.	.23 /	.24
AA-1177	lb.	.155 /	.165
Aminox	lb.	.57 /	59
Antioxidant 425	lb.	2.47 /	2.50
2246	lb.	1.50 /	1.53
Antisol	lb.	.23 /	.24
Antisun	lb.	.15 /	.51
Antox	lb.	.59 /	.61
Aranox	lb.	3.25	
Betanox Special	lb.	.94 /	.96
B-L-E, -25	lb.	.57 /	.59
Burgess Antisun Wax	lb.	.185	
B-X-A	lb.	.55 /	.60
CAO-1	lb.	.37 /	.86
-5	lb.	1.49 /	1.63
Copper Inhibiter X-872-L	lb.	2.01	
D-B-P-C	lb.	.91 /	1.16
Deenax	lb.	.95	
Flectol H	lb.	.57 /	.59
Flexamine	lb.	.79 /	.81
Heliozone	lb.	.31 /	.32
Ionol	lb.	.91 /	1.65
Microflake	lb.	.20 /	.24
Naugawhite	lb.	.57 /	.59
NBC	lb.	1.67	
Neozone A	lb.	.64 /	.66
C	lb.	.86 /	.88
D, Special	lb.	.57 /	.59
Nevastain A	lb.	.51 /	.61
B	lb.	.51 /	.70
Nonox CI	lb.	1.50 /	1.67
WSL	lb.	1.50 /	1.60
WSP	lb.	1.47 /	1.60
Octamine	lb.	.57 /	.59
PDA-10	lb.	.46 /	.48
Pennox A, C, D	lb.	.57 /	.59
B	lb.	.67 /	.69
Permalux	lb.	2.25	
Polygard	lb.	.57 /	.59
Polylite	lb.	.55 /	.60
Protector	lb.	.41	
Rio Resin	lb.	.70 /	.72
Santoflex			
75	lb.	1.01 /	1.03
AW	lb.	.71 /	.73
DD	lb.	.57 /	.59
Santovar A	lb.	1.55 /	1.57
Santowhite Crystals, Powd.	lb.	1.55 /	1.57
L	lb.	.57 /	59
MK	lb.	1.25 /	1.27
Stabilite	lb.	.55 /	59
Alba	lb.	.72 /	.79
L	lb.	.60 /	.64
White	lb.	.52 /	.60
Powder	lb.	.41 /	.47
Styphen I	lb.	.51 /	.55
Sunolite #100	lb.	.21 /	.23
#127	lb.	.17 /	.19
Sunproof-713	lb.	.26 /	.27
Improved	lb.	.25 /	.26
Jr.	lb.	.22 /	.23
Tenamene 3	lb.	.91 /	1.05
Thermoflex A	lb.	1.05 /	1.07
Tonox	lb.	.54 /	.59
Velvarex 51-250	lb.	.40	
V-G-B	lb.	.75 /	.80
Zalba	lb.	1.10	
Zenite	lb.	.52 /	.54

Antiozonants

Eastozone 30, 31	lb.	1.05 /	1.09
32	lb.	1.15 /	1.20
Flexone 3-C	lb.	2.00	
6-H	lb.	1.25 /	1.27
Nonox ZA	lb.	1.99 /	2.00
Santoflex AW	lb.	.71 /	.73
Tenamene 30, 31	lb.	1.24 /	1.28
Tysonite	lb.	.30 /	.307
UOP 88, 288	lb.	1.05 /	1.07
Wing-Stay S, T	lb.	.55 /	.67
100	lb.	1.00 /	1.08

Antiseptics

Copper naphthenate, 6-8%	lb.	.245	
Pentachlorophenol	lb.	.22 /	.30
Resorcinol, technical	lb.	.775 /	.785
Zinc naphthenate, 8-10%	lb.	.245 /	.30

Blowing Agents

Ammonium bicarbonate	lb.	.07 /	.09
Carbonate	lb.	.16	

* Prices, in general, are f.o.b. works. Range indicates grade or quantity variations. No guarantee of these prices is made. Spot prices should be obtained from individual suppliers.

† For trade names, see Color—White, Zinc Oxides.

Blowing Agent 8110S	lb.	$0.32	$0.35
Celogen	lb.	1.95	
-80	lb.	1.60	
-AZ	lb.	1.92	
Kempore R-125	lb.	1.92	
Opex 40	lb.	.72	
PL-80	lb.	1.44	
Sodium bicarbonate...100 lbs.		2.55	3.85
Carbonate, tech.....100 lbs.		1.35	5.52
Sponge Paste	lb.	.20	
Unicel ND	lb.	.72	
NDX	lb.	1.44	
S	lb.	.20	
Vulcacel BN	lb.	1.36	1.51
BMC	lb.	.68	.79

Bonding Agents

Braze	gal.	6.00	9.00
Cover cement	gal.	2.50	4.00
Chemlok 201, 203	gal.	5.00	7.50
220	gal.	9.25	12.00
401	gal.	11.70	14.40
602	gal.	25.00	26.00
607	gal.	18.00	
614	lb.	4.35	4.75
Flocking Adhesive RFA17, RFA22, RFA25	lb.	.50	
G-E Silicone Paste SS-15	lb.	4.52	5.10
SS-64	lb.	3.65	6.75
-67 Primer	lb.	7.50	12.50
Gen-Tac Latex	lb.	.70	.805
Hylene M	lb.	1.25	2.75
M-50	lb.	.86	2.36
Kalabond Adhesive	gal.	6.50	16.00
Tie Cement	gal.	2.00	5.60
Thixons	gal.	1.48	12.00
Ty Ply, BN, Q. S, UP, 3640	gal.	6.75	8.00
BC	gal.	4.50	6.00
RC	gal.	3.75	5.00

Brake Lining Saturants

BRT 3	lb.	.018	.0265
Resinex L-S	lb.	.0225/	.03

Carbon Blacks‡

Conductive Channel—CC

Continental R-40	lb.	.26	.35
Kosmos/Dixie BB	lb.	.23	.30
Texas MC-74-BD	lb.	.26	.35
Voltex	lb.	.18	.315

Easy Processing Channel—EPC

Continental AA	lb.	.08	.1625
Kosmobile 77/Dixiedensed 77	lb.	.074	.1225
Micronex W-6	lb.	.08	.1625
Spheron #9	lb.	.085	.1625
Texas E	lb.	.08	.1625
Witco #12	lb.	.08	.1625
Wyex EPC	lb.	.08	.1625

Medium Processing Channel—MPC

Arrow MPC	lb.	.08	.1625
Continental A	lb.	.08	.1625
Kosmobile S-66/Dixiedensed S-66	lb.	.0775/	.145
Micronex Standard	lb.	.08	.1625
Spheron #6	lb.	.085	.1625
Texas M	lb.	.08	.1625
Witco #1	lb.	.08	.1625

Conductive Furnace—CF

Aromex CF	lb.	.0875/	.155
Continex CF	lb.	.11	.17
Vulcan C	lb.	.110	.185
SC	lb.	.18	.255
XC-72	lb.	.25	.34

Fast Extruding Furnace—FEF

Arovel FEF	lb.	.0625/	.135
Continex FEF	lb.	.0625/	.135
Kosmos 50/Dixie 50	lb.	.06	.10
Philblack A	lb.	.0675/	.135
Statex M	lb.	.0625/	.135
Sterling SO	lb.	.0675/	.135

Fine Furnace—FF

Statex B	lb.	.0675/	.14
Sterling 99	lb.	.0725/	.14

High Abrasion Furnace—HAF

Aromex HAF	lb.	.0725/	.145
Continex HAF	lb.	.0725/	.145
Kosmos 60/Dixie 60	lb.	.079	.1175
Philblack O	lb.	.0775/	.145
Statex R	lb.	.0725/	.145
Vulcan #3	lb.	.0775/	.145

Intermediate Super Abrasion Furnace—ISAF

Aromex ISAF	lb.	.0875/	.16
Continex ISAF	lb.	.0875/	.16
Kosmos 70/Dixie 70	lb.	.10	.045
Philblack I	lb.	.0925/	.16
Statex 125	lb.	.0875/	.16
Vulcan 6	lb.	.0925/	.16

General-Purpose Furnace—GPF

Arogen GPF	lb.	.055	.1275
Continex GPF	lb.	.055	.1275
Statex G	lb.	.055	.1275
Sterling V	lb.	.06	.1275
Non-staining	lb.	.06	.1275

High Modulus Furnace—HMF

Continex HMF	lb.	$0.0575/	$0.13
Kosmos 40/Dixie 40	lb.	.055 /	.095
Modulex HMF	lb.	.0625/	.13
Statex 93	lb.	.0575/	.13
Sterling L, LL	lb.	.0625/	.13

Semi-Reinforcing Furnace—SRF

Continex SRF	lb.	.0525/	.125
Essex SRF	lb.	.0525/	.125
Furnex	lb.	.0525/	.125
Gastex	lb.	.0625/	.135
Kosmos 20/Dixie 20	lb.	.0575/	.0775
Pelletex, NS	lb.	.0575/	.125
Regal	lb.	.0575/	.125
Sterling NS, S	lb.	.0575/	.125
R	lb.	.0625/	.135

Super Abrasion Furnace—SAF

Aromex SAF	lb.	.1150/	.1825
Philblack E	lb.	.115 /	.19
Statex 160	lb.	.11 /	.19
Vulcan 9	lb.	.115 /	.19

Fine Thermal—FT

P-33	lb.	.0575/	.0625
Sterling FT	lb.	.0625	

Medium Thermal—MT

Sterling MT	lb.	.045	
Non-staining	lb.	.055	
Thermax	lb.	.04 /	.045
Stainless	lb.	.05 /	.055

Awaiting Classification

Regal 300	lb.	.0775/	.145
600	lb.	.0925/	.16

Colors

Black

Iron oxides, comml.	lb.	.1235/	.135
BK—Lansco	lb.	.1275/	.13
Williams	lb.	.145	
Lansco synthetic	lb.	.10	
Mapico pure synthetic	lb.	.1475/	.15
Lampblack, comml.	lb.	.16 /	.45
Superjet	lb.	.085 /	.12
Permanent Blue	lb.	.80 /	1.05
Stan-Tone	lb.	.45 /	1.20
Vansul masterbatch	lb.	.60 /	.65
Paste	lb.	.14 /	.15

Blue

Alkali Blue G, R	lb.	2.38	
C. P. Iran Blues	lb.	.52 /	.54
Du Pont	lb.	2.55 /	4.75
Filo	lb.	.28	
Heveatex pastes	lb.	.80 /	1.45
Lansco ultramarines	lb.	.25 /	.28
Monsanto Blue 7	lb.	1.55	
11	lb.	3.45	
DPB-283	lb.	1.93	
S-11	lb.	2.05	
Permanent Blue	lb.	.80 /	1.05
Solfast	lb.	1.60 /	3.25
Stan-Tone Violet Blue			
D-4000	lb.	3.45	
4001	lb.	3.00	
4002	lb.	.90	
4900	lb.	1.97 /	2.15
Vansul masterbatch	lb.	.90 /	2.70

Brown

Filo	lb.	.13	
Iron oxides, comml.	lb.	.1425/	.145
Lansco synthetic	lb.	.125	
Mapico Brown	lb.	.1575/	.16
Sienna, burnt, comml.	lb.	.0425/	.155
Williams	lb.	.115 /	.1775
Raw, comml.	lb.	.045 /	.1325
Williams	lb.	.08 /	.1725
Umber, burnt, comml.	lb.	.06 /	.07
Williams	lb.	.0725/	.085
Raw, comml.	lb.	.0625/	.07
Williams	lb.	.07 /	.0825
Williams, pure brown	lb.	.155	
Vandyke	lb.	.12	
Mapico Tan	lb.	.2325/	.235
Metallic brown pure synthetic	lb.	.05 /	.06
Vansul masterbatch	lb.	2.10 /	2.20

Green

Chrome	lb.	.42 /	.45
Green	lb.	.80 /	2.40
Oxide	lb.	.3925/	1.10
Cyanamid	lb.	.42 /	.45
Green G	lb.	3.00	
Lincoln Green	lb.	5.30 /	6.60
G-4099-6099	lb.	.4450/	.4525
GH-9869	lb.	1.10 /	1.25
9976	lb.	1.20 /	1.35
Du Pont	lb.	2.05 /	2.80
Filo	lb.	.40	
Heveatex pastes	lb.	.95 /	1.85
Lansco Toner	lb.	1.35	
Monsanto Green 3	lb.	2.75	
14	lb.	1.45	
17	lb.	3.95	
71205	lb.	1.35	
DGP	lb.	2.03	
S-17	lb.	2.25	

‡ At the request of the suppliers, the lowest prices shown for carbon blacks are for carloads in bags. Prices for hopper carloads are lower.

Permanisa	lb.	$1.45	
Serene	lb.	3.50	
Solfast	lb.	1.60 /	$3.35
Stan-Tone			
D-5000	lb.	3.95	
5001	lb.	.82	
5400	lb.	1.50	
Vansul masterbatch	lb.	2.00 /	2.60

Orange

Benzidine 12193	lb.	3.30	
Cyanamid Permatons	lb.	1.56	
Dianisidine 10406	lb.	2.85	
Du Pont	lb.	2.25	
Molybdate	lb.	.49	
Monsanto Orange 68187	lb.	2.90	
Stan-Tone			
Light orange 70 PCO3	lb.	2.48 /	2.76
D-7003	lb.	3.97 /	4.17
Orange 70 PCO4	lb.	2.80 /	3.08
D-7004	lb.	4.23 /	4.43
7104	lb.	1.85 /	2.05
Vansul masterbatch	lb.	2.00 /	2.60

Red

Antimony trisulfide	lb.	.285 /	.315
R. M. P. No. 3	lb.	.72	
Sulfur Free	lb.	.78	
Arcturus CP-1270	lb.	1.35	
Brilliant Toning Red	lb.	.77 /	1.90
Cadmium red lithopones	lb.	2.21 /	3.77
Cadmolith	lb.	1.72 /	2.20
Cyanamid	lb.	.91 /	2.00
Naphthol Red, Scarlet	lb.	2.95 /	3.80
Du Pont	lb.	2.00 /	2.05
Filo	lb.	.11	
Indian Red	lb.	.1275	
Iron oxide, comml.	lb.	.06 /	.13
Lansco synthetic	lb.	.1175	
Mapico pure synthetic	lb.	.1425/	.145
Recco	lb.	.12	
Williams Red	lb.	.13 /	.1525
Lake Red C, CP-1104	lb.	1.25	
Monsanto Maroon 113	lb.	1.50	
61148	lb.	1.75	
Red 7	lb.	1.55	
41	lb.	4.40	
3501	lb.	1.15	
4004	lb.	1.50	
69191	lb.	3.38	
Autumn	lb.	1.10	
PRP-285	lb.	1.27	
S-44	lb.	1.28	
Plasticone	lb.	1.02 /	4.60
Rub-Er-Red	lb.	.0975	
Solfast	lb.	1.60 /	1.80
Stan-Tone			
70 PCO5	lb.	3.00 /	3.28
D-2000	lb.	1.25	
2110, 2120, 2121	lb.	.98	
2200	lb.	1.47	
2500	lb.	1.90	
2600	lb.	4.60	
2601	lb.	1.60	
2700	lb.	1.75	
2800	lb.	1.90	
Light Red D-7005	lb.	4.68 /	4.88
7105	lb.	1.97 /	2.17
Red 70 PCO6	lb.	3.35 /	3.63
D-7006	lb.	4.89 /	5.09
-7106	lb.	2.20 /	2.40
Vansul masterbatch	lb.	.95 /	3.30
Venetian	lb.	.04 /	.0675

White

Antimony oxide	lb.	.27 /	.285
Burgess Iceberg	ton	50.00 /	80.00
Cryptone BT	lb.	.10 /	.11
Permolith lithopone	lb.	.0825/	.0912
Titanium pigments			
Horse Head Anatase	lb.	.255 /	.27
Rutile	lb.	.275 /	.29
Rayox LW	lb.	.195 /	.205
R-110	lb.	.215 /	.225
Ti-Cal	lb.	.075 /	.0825
Ti-Pure	lb.	.195 /	.225
Titanox A, AA, A-168	lb.	.255 /	.265
C-50	lb.	.1438/	.1488
RA, -10, -50	lb.	.275 /	.285
RC	lb.	.0963/	.1013
-HT, -HTX	lb.	.0963/	.0988
Rutile	lb.	.205 /	.29
Unitane	lb.	.255 /	.29
Zopaque Anatase	lb.	.245 /	.27
Zinc oxide, comml.	lb.	.145 /	.1825
Azo ZZZ-11, -44, -55	lb.	.145 /	.155
12% leaded	lb.	.125 /	.135
35% leaded	lb.	.15375/	.16375
50% leaded	lb.	.1575/	.1675
Eagle AAA, lead free	lb.	.145 /	.155
5% leaded	lb.	.145 /	.155
35% leaded	lb.	.15375/	.16375
50% leaded	lb.	.1575/	.1675
Florence Green Seal	lb.	.1625/	.1725
Red Seal	lb.	.1575/	.1675
White Seal	lb.	.1675/	.1775
Horsehead XX-4, -78	lb.	.145 /	.155
Kadox-15, -17, -72, -515	lb.	.145 /	.155
-25	lb.	.15 /	.16
Lehigh, 35% leaded	lb.	.15375/	.16375
50% leaded	lb.	.1575/	.1675
Protox-166, -167	lb.	.145 /	.155
St. Joe, lead free	lb.	.145 /	.175
Zinc sulfide, comml.	lb.	.253 /	.263
Cryptone ZS	lb.	.253 /	.263

Dr. Stanley Jankowski, one of Neville's senior chemists, is shown here holding a test chart showing the results of tensile testing three aged rubber samples. The chart is just as it came from the Instron Tester, except that scribe lines have been inked over and labeled for visability in the picture. They have not been changed. From left to right, samples contained Neville's R-16 Coumarone-Indene Resin, competitive resin A and competitive resin B. Detailed results are shown below.

Competitive tensile test shows Neville Resin superior

Neville's R-16 Coumarone-Indene Resin was matched against two other leading resins in a neutral colored SBR test recipe compounded for comparative analysis. The results were as follows:

	Average Tensile	Aged Average Tensile	% Tensile Retention
Neville's R-16	1830 psi	1400 psi	76.5
Competitor A	1680 psi	1150 psi	68.5
Competitor B	1655 psi	1275 psi	77.2

Beyond superior tensile strength, there are other benefits derived from compounding rubber with R-16 Neville Resin. Elongation, both before and after aging, is exceptional and considerable aid to processing is enjoyed. Better mold flow and easier dispersion of fillers are also realized in using R-16 Neville Resin. Use the coupon to write for further information.

Resins—Coumarone-Indene, Heat Reactive, Phenol Modified Coumarone-Indene, Petroleum, Styrenated, Alkylated Phenol • **Oils**—Shingle Stain, Neutral, Plasticizing, Rubber Reclaiming • **Solvents**—2-50-W Hi-Flash*, Wire Enamel Thinners, Nevsolv* • **High Purity Indene.** *Trade Name

Neville Chemical Company, Pittsburgh 25, Pa.

NEVILLE®

☐ Please send information on Neville Coumarone-Indene Resins.

NAME TITLE

COMPANY

ADDRESS

CITY STATE

Yellow			
Benzidine 12199	lb.	$0.58 /	$2.55
Cadmium yellow lithopones	lb.	1.12 /	1.15
Cadmolith	lb.	1.12 /	1.20
Chrome	lb.	.135 /	.145
Cyanamid Hansa Yellow	lb.	2.20	
Du Pont	lb.	2.25	
Filo	lb.	.10	
Iron oxide, commil	lb.	.0525 /	.1175
Lansco synthetic	lb.	.1075	
Mapico pure synthetic	lb.	.12 /	.1275
Williams	lb.	.115 /	.1225
Lightfast Benzidine 12220	lb.	3.40	
Monsanto Yellow 14	lb.	1.91	
10010	lb.	1.91	
BVP-282	lb	1.21	
GA	lb.	2.45	
S-10010	lb.	1.17	
Stan-Tone			
D-1100	lb.	2.55	
1101	lb.	.69	
Lemon 70 PCO1	lb.	1.77 /	2.19
D-7001	lb.	2.80 /	3.00
Medium yellow 70 PCO2	lb.	1.79 /	2.21
D-7002	lb.	2.98 /	3.18
Vansul masterbatch	lb.	.95 /	1.95
Williams Ocher	lb.	.0575/	.06

Dusting Agents

Antidust	lb.	.405 /	.445
Diatomaceous silica	ton	32.00 /	48.00
Extrud-o-Lube, conc	gal.	1.33 /	1.69
Glycerized Liquid Lubricant, concentrated	gal.	1.25 /	1.63
Glyso-Lube, #3	lb.	.14	
Latex-Lube GR	lb.	.20	
Pigmented	lb.	.1825	
R-66	lb.	.165	
Liqui-Lube	lb.	.1625	
N. T.	lb.	.1675	
Liquizinc No. 305	lb.	.30 /	.35
Lubrex	lb.	.25 /	.30
Mica 160 Biotite	lb.	.065 /	.0725
Mesh	lb.	.08 /	.0875
325 Mesh	lb.	.0825/	.09
Concord	lb.	.08 /	.09
Mineralite	ton	45.00	
Pigmented Separex, LG	lb.	.105	
Slab-Dip, S-20	lb.	.11 /	.15
Pyrax A	ton	14.50 /	15.00
W. A	ton	17.00 /	17.50
Rexanol	lb.	.13	
Talc, commil	ton	18.40 /	38.50
EM	ton	11.00 /	63.00
LS Silver	ton	20.25	
Nytals	ton	28.00 /	38.00
Sierra Sagger 7	ton	34.00	
White IR	ton	19.75	
III	ton	20.75	
Vanfre	gal.	1.95 /	3.00
Wet-Zinc, CW, P	lb.	.20 /	.2225

Extenders

BRS 700	lb.	.02 /	.036
BRT 7	lb.	.035 /	.036
Cumar Resins	lb.	.095 /	.19
Dielex B	lb.	.06	
Factice, Amberex	lb.	.29 /	.36
Brown	lb.	.1425/	.263
Neophax	lb.	.157 /	.268
White	lb.	.144 /	.285
G. B. Asphaltenes	lb	.097 /	.177
Millex, W	lb.	.07	
Mineral Rubbers			
Black Diamond	ton	48.00 /	40.00
Hard Hydrocarbon	ton	53.00 /	60.00
Hydrocarbon MR	ton	45.00 /	55.00
Parmr	ton	21.00 /	29.00
T-MR Granulated	ton	47.50 /	50.00
Nuba No. 1, 2	lb.	.0575/	.0625
3X	lb.	.0775/	.0825
OPD-101	lb.	.26	
Rubber substitute, brown	lb.	.16 /	.2572
Car-Bel-Ex A	lb.	.14	
Car-Bel-Lite	lb.	.35	
Extender 606	lb.	.1765	
White	lb.	.192 /	.2103
Stan-Shells	ton	55.00 /	73.00
Sublac Resin PX-5	lb.	.215 /	.235
Sundex 53	gal.	.12	
85	gal.	.1725	
Synthetic 100	lb.	.41	
Vistanex L grades	lb.	.35	

Fillers, Inert

Agrashell flour	ton	50.00 /	74.00
Albacar	ton	55.00 /	75.00
Barytes, floated, white	ton	39.00 /	70.85
No. 1	ton	55.00 /	77.50
2	ton	50.00 /	72.50
Off-color, domestic	ton	25.00	
Sparmite	ton	95.00 /	117.00
Blanc fixe	ton	100.00 /	165.00
Burgess HC-75	ton	12.00 /	30.00
80	ton	14.00 /	32.00
Iceberg	ton	50.00 /	80.00
Pigment #20	ton	35.00 /	60.00
#30	ton	37.00 /	60.00
WP #1	ton	11.00 /	16.00
Camel-Carb	ton	14.00	
-Tex	ton	22.00	
-Wite	ton	35.00	
Cary #200	ton	30.00 /	55.00
Citrus seed meal	lb.	.04	
Oil	lb.	.15	

Note

Suppliers are requested to submit product additions or deletions and price changes promptly as they occur in order that we may make the listing of maximum service to our readers. Comments on the present listing and classifications are invited with a view toward facilitating location of specific items.

Correspondence should be directed to Market Editor, RUBBER WORLD, 630 Third Avenue, New York 17, New York.

Diatomaceous silica	ton	$32.00 /	$48.00
Flocks			
Cotton, dark	lb.	.095 /	.135
Dyed	lb.	.55 /	.60
White	lb.	.13 /	.33
Fabrifil X-24-G	lb.	.135	
X-24-W	lb.	.235	
Filfloc 6000	lb.	.33	
F-40-900	lb.	.135	
HSC #35 Silicone Emulsion	lb.	1.22 /	2.46
Hydrite	ton	25.00 /	50.00
Kalite	ton	52.50 /	67.50
Lithopone, commil	lb.	.075 /	.085
Eagle	lb.	.0725/	.075
Permolith	lb.	.08 /	.0875
Sunolith	lb.	.075 /	.0825
Mica, 160 Biotite	lb.	.065 /	.0725
Mesh	lb.	.08 /	.0875
160 Mesh, 325 Mesh	lb.	.075 /	.09
Concord	lb.	.08 /	.09
Millical	ton	38.00 /	53.00
Mineralite	ton	40.00 /	60.00
Non-Fer-Al	ton	35.00 /	50.00
Ohio Superspray lime	ton	16.50	
Pulverized limestone, Stonelite	ton	8.25 /	11.00
Purecal	ton	56.75 /	71.75
Pyrax A	ton	14.50 /	15.00
W. A	ton	17.00 /	17.50
Sawdust	ton	14.00 /	35.00
Silversheen Mica	lb.	.08 /	.09
Stan White	ton	10.50 /	13.10
Super-White Silica	ton	25.00 /	46.50
Surfex	ton	37.50 /	52.50
MM	ton	42.00 /	57.00
Suspenso	ton	38.00 /	53.00
Ti-Cal	lb.	.0675	
Valron Estersil	lb.	2.00 /	2.25
Walnut shell flours	ton	50.00 /	84.00
Whiting, limestone			
Atomite	ton	32.50 /	35.00
Calcite	ton	23.00	
Calwhite	ton	20.00 /	27.00
-T	ton	23.00	
Duramite	ton	20.00	
Gamaco	ton	32.50 /	40.00
Keystone	ton	20.00 /	22.00
Laminar	ton	30.00	
No. 10 White	ton	11.00 /	16.50
Omya	ton	30.00	
BSH	ton	45.00	
Paxinosa	ton	14.50 /	22.50
Snowflake	ton	17.00 /	18.00
Witco	ton	13.00	
York	ton	9.50	

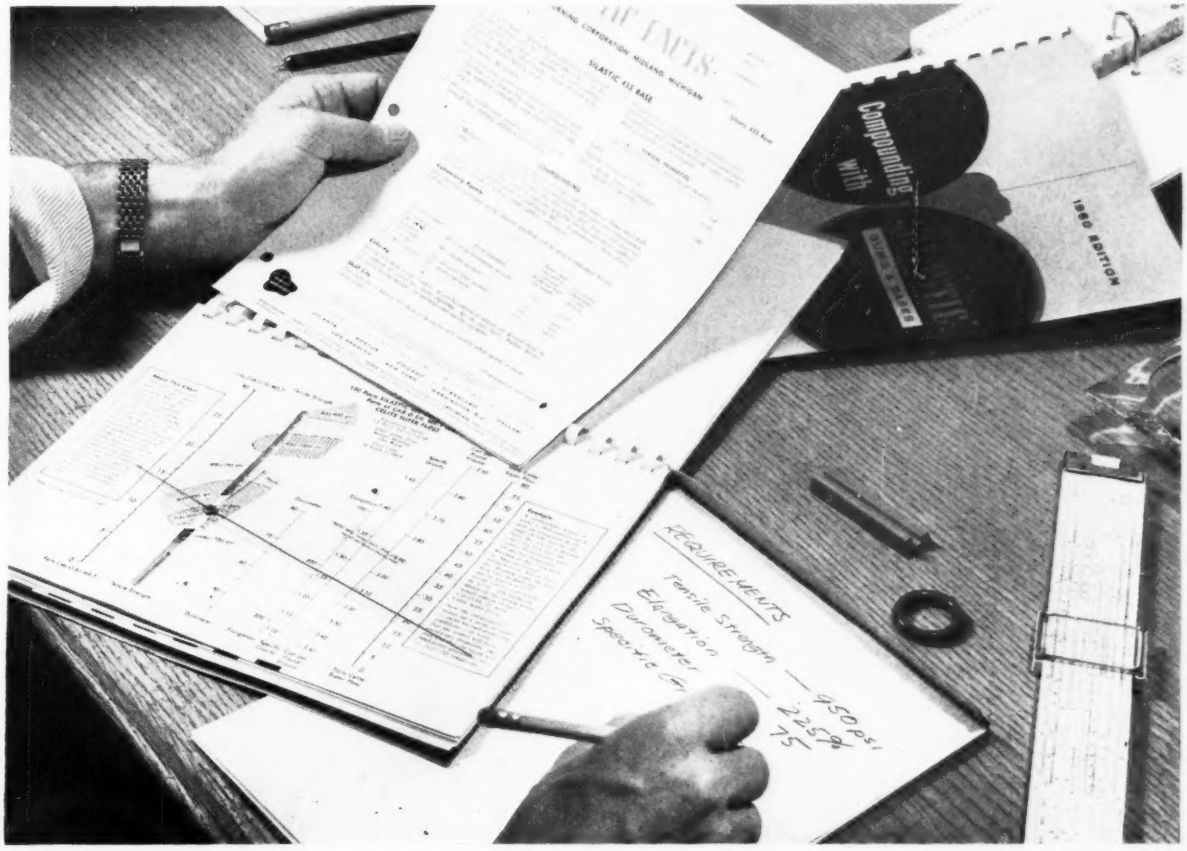
Finishes

Apex Bright Finish #5200-E	lb.	.25	
Rubber Finish	gal.	2.50	
Black-out	gal.	4.50 /	8.00
Flocks, Rayon, colored	lb.	.90 /	1.50
White	lb.	.75 /	1.25
Also see Flocks, under Fillers, Inert			
Paraffint RG and RGU Synthetic Wax	lb.	.15 /	.22
Rubber lacquer, clear	gal.	1.00 /	2.00
Shellacs, Angelo	lb.	.485 /	.7425
Vac Dry	lb	.485 /	.57
Talc (*See Talc, under Dusting Agents*)			
Unidip	lb.	.15 /	.20
Wax, Bees	lb.	.67 /	.83
Carnauba	lb.	.57 /	1.13
Mouten	lb.	.27	
Neutral	gal.	.76 /	1.31
No. 118, colors	gal.	.86 /	1.41
Van Wax	gal.	2.00 /	2.05

Latex Compounding Ingredients

Acintol D, DLR	lb.	.0625/	.085
FA #1	lb.	.0675/	.09
#2	lb.	.0825/	105
Accelerator 552	lb.	2.25	
Accelerator J-117, -302	lb.	1.00 /	1.15
-144	lb.	.15 /	.30
-307	lb.	1.10 /	1.25
-311	lb.	.60 /	.75
Aerosol, dry types	lb.	.65 /	.80
Liquid types	lb.	.40 /	.75
Alcogard 354	lb.	1.40 /	1.42
Alcogum AK-12	lb.	$0.12 /	$0.14
AN-6	lb.	.055 /	.06
-10	lb.	.09 /	.10
-25	lb.	.31	
PA-15	lb.	.16	
Alrosol	lb.	.41	
Amberex solutions	lb.	.1675/	.18
Antifoam J-114	lb.	3.25 /	3.45
P-242	lb.	.24 /	.35
Antioxidant J-137, -140	lb.	.55 /	.70
-139, -293	lb.	1.45 /	1.60
-182	lb.	2.00 /	2.15
-186	lb.	1.40 /	1.55
2246	lb.	1.50 /	1.53
Anti Webbing Agent J-183	lb.	.75 /	.90
-297	lb.	.27 /	.40
Aquablak B	lb.	.0975/	.1025
G	lb.	.12 /	.125
K	lb.	.12 /	.125
M	lb.	.105 /	.11
Aquarex D	lb.	.81	
G	lb.	.21	
L	lb.	.94	
MDL	lb.	.33	
ME	lb.	.82	
Aquarex NS	lb.	.60	
SMO	lb.	.50	
WAQ	lb.	.22	
Ben-A-Gels	lb.	.98 /	1.40
Bentone 18, 18C	lb.	.45	
34	lb.	.60	
Casein	lb.	.22	
Cellosize WP-09, -3, -40, -300	lb.	1.00 /	1.17
CW-12	lb.	.85	
-37	lb.	.70	
DC Antifoam A Compound	lb.	5.45 /	6.65
B	lb.	.63 /	1.10
Emulsion	lb.	2.05 /	4.00
AF Emulsion	lb.	2.05 /	2.85
Compound 7	lb.	5.13 /	6.50
Defoama W-1701	lb.	.125	
Defoamer 115a	lb.	.50	
NDW	lb.	.215 /	.235
Dispersing Agents			
Blancol	lb.	.1525/	.26
N	lb.	.155 /	.26
Darvan Nos. 1, 2, 3	lb.	.22 /	.30
Daxad 11, 21, 23, 27	lb.	.08 /	.30
Dispersaid H7A	lb.	.58	
1159	lb.	.43	
Emulphor ON-870	lb.	.50 /	.70
Igepal CO-630	lb.	.2875/	.47
Igepon T-73	lb.	.285 /	.495
T-77	lb.	.45 /	.69
Indulins	lb.	.06 /	.08
Kreelons	lb.	.132 /	.155
Laurelton Oil	lb.	.18	
Leonil SA	lb.	.52 /	.65
Lomar PW	lb.	.18	
Marasperse CB	lb.	.1225/	.1425
N	lb.	.095 /	.105
Modicols	lb.	.17 /	.58
Nekal BA-75	lb.	.395 /	.54
BX-76	lb.	.63 /	.75
Nopco 1287	lb.	.155 /	.195
Orzan A	lb.	.0325	
S	lb.	.0425	
Pluronics	lb.	.335 /	.40
Polyfons	lb.	.08 /	.09
Sorapon SF-78	lb.	.28 /	.40
Tergitol 7	lb.	.4125/	.44
NPX	lb.	.275 /	.3074
TMN	lb.	.2875/	.32
Trennime W-30	lb.	.15	
W-40	lb.	.60 /	.75
Triton R-100	lb.	.12 /	.25
X-100, -102, -114	lb.	.255 /	.36
Dispersions			
Agebest 1293-22	lb.	1.90 /	2.00
AgeRite Alba	lb.	3.00	
Powder, Resin D	lb.	.80	
White	lb.	1.80	
Altax	lb.	.75	
Shield No. 2, 6	lb.	.08	
3	lb.	.095	
4-35	lb.	.09	
5	lb.	.093	
7-F, 8	lb.	.165	
55	lb.	.18	
Iron Oxide, 60%	lb.	.40	
L.S.W.	lb.	1.50	
No. 305 Liquizinc	lb.	.30 /	.35
P-33	lb.	.35	
Rotax	lb.	.75	
Sulfur	lb.	.13 /	.15
Telloy	lb.	3.62	
Tuads, Methyl	lb.	1.60	
Vulcacure NB	lb.	.45	
NS	lb	.75 /	1.05
T.M.D.	lb.	1.14	
ZB, ZE, ZM	lb.	.85 /	.89
Vulcanizing, C group	lb.	.40 /	1.30
G group	lb.	.45 /	.90
N group	lb.	.40 /	1.00
Zetax	lb.	.75	
Zimates, Butyl	lb.	1.30	
Ethyl, Methyl	lb.	1.35	
Zinc oxide	lb.	.40	
Emulsions			
AgeRite Spar	lb.	1.00	
Stalite	lb.	.75	
Superlite	lb.	1.00	
Borden Arco A-25, A-26, 716-30	lb.	.18 /	.19
555-40R	lb.	.195 /	.205
620-32B	lb.	.20 /	.21
716-35	lb.	.17 /	.18
1041-21	lb.	.165 /	.175

The Compleat Compounder



Silastic Bases Simplify Compounding, Expand Formulating Freedom

Rubber compounding is a complex problem with the many polymers available today. But you can avoid many of the problems involved in compounding silicone rubber by always starting with Silastic® gums and bases. When you buy Silastic brand compounding materials you're actually buying a compounding service. Look at what this includes:

1. Dow Corning supplies the initial information you need. Tested recipes, formulations to meet MIL specs, newest procedures and personal technical service are all available to compounders.

2. Number of ingredients added to Silastic gums and bases are minimized when compounding. To compound for a specific property, you need only five or six ingredients—not a dozen plus. Many properties your customer needs are inherent in Silastic...serviceable range from —130 to 500 F, low compression set, high elongation, strength and even superior solvent resistance.

3. Silastic gums and bases band quickly, won't crumble, absorb fillers readily and can be stripped from mill rolls with a knife. Silastic has good green strength and minimum shelf life of six months.

With one Silastic base material you can compound for a wide range of physical properties or applications, thus speeding production and improving the quality of your products. Stocks made from a Silastic base fabricate easily into custom parts to meet any customer's design. Another tangible benefit: you now inventory only one base instead of many finished stocks.

We invite you to investigate the advantages you accrue in compounding with Silastic materials, then make *your* own decision. Write for full information by addressing Dept 7909.

Dow Corning Silicones solve sticking problems, too ... as mold release agents, and as paper coatings for packaging and processing sticky materials.

first in silicones

Dow Corning CORPORATION
MIDLAND, MICHIGAN

ATLANTA BOSTON CHICAGO CLEVELAND DALLAS LOS ANGELES NEW YORK WASHINGTON, D. C.

Emulsions (cont'd)

Habuco Resin Nos. 502, 515, 523	lb.	$0.195 /	$0.20
503	lb.	.22 /	.225
504, 526	lb.	.19 /	.195
517	lb.	.175 /	.18
524	lb.	.155 /	.16
Resin A-2	lb.	.16 /	.25
P-370	lb.	.175 /	.25
X-210	lb.	.12 /	.22
Freeze-Stabilizer 322	lb.	.40	
12116C	lb.	.52	
Hyonic PE 250	lb.	.255 /	.295
Igepon T-43	lb.	.145 /	.35
T-51	lb.	.125 /	.285
-73	lb.	.285 /	.495
Ludox	lb.	.1675/	.195
Marmix	lb.	.41 /	.48
Merac	lb.	.75 /	1.05
Micronex, colloidal	lb.	.06 /	.072
Modical S	lb.	.3084/	.3284
VD	lb.	.1384/	.1584
Monsanto Blue 4685 WD	lb.	1.60	
Green 4884 WD	lb.	1.80	
Red 127	lb.	1.25	
OPD 101	lb.	.16 /	.26
Picco Latex Plasticizer A-12	lb.	.069 /	.096
Pliolite Latex 150, 190	lb.	.32 /	.41
170	lb.	.37 /	.46
Polyvinyl methyl ether	lb.	.25 /	.45
Resin V	lb.	.13	
Roelgel 100C	lb.	.46	
Santomerse #3 Paste	lb.	.26 /	.30
Sellogen Gel	lb.	.1275	
Sequestrene AA	lb.	.905 /	.975
ST	lb.	.585 /	.615
30A	lb.	.245 /	.265
Setsit #5	lb.	.75 /	1.05
#9	lb.	.85 /	1.15
Stablex A	lb.	.80 /	1.10
B, G	lb.	.50 /	.95
K	lb.	.27 /	.35
P	lb.	.35 /	.50
T	lb.	.14 /	.22
Surfactol 13	lb.	.345 /	.36
Vult-Accel E	lb.	.85 /	.92
Webnix	lb.	1.50 /	2.50

Mold Lubricants

A-C Polyethylene	lb.	.275 /	.52
Acintol D	lb.	.0625/	.085
Alipal CO-433	lb.	.25 /	.45
CO-436	lb.	.22 /	.41
Aquarex Compounds	lb.	.21 /	.94
Carbowax 200, 300, 400	lb.	.22 /	.25
1500	lb.	.225 /	.2825
4000	lb.	.31 /	.32
6000	lb.	.35 /	.36
Castorwax	lb.	.3375/	.3575
Colite Concentrate	gal.	.90 /	1.15
D-Tak Dip #10	gal.	1.50	
DC Mold Release Fluid	lb.	3.14 /	4.75
200 Fluid	lb.	3.14 /	4.75
Compound 4, 7	lb.	5.13 /	6.50
Emulsion 7	lb.	1.20 /	1.74
8, 35, 35A, 35B, 36	lb.	1.20 /	1.74
ELA	lb.	.82	
FT Wax 200	lb.	.265 /	.42
300	lb.	.295 /	.45
Glycerized Liquid Lubricant, concentrated	gal.	1.25 /	1.63
Igepals	lb.	.2875/	.74
Igepon AP-78	lb.	.44 /	.68
T-43	lb.	.145 /	.35
-51	lb.	.125 /	.285
-73	lb.	.285 /	.495
L-45 Silicone Oil	lb.	2.90 /	4.61
LE-45 Silicone Oil Emulsion	lb.	1.15 /	1.69
LE-450 Silicone Emulsion	lb.	1.15 /	1.69
L-520 Organo-Silicone Fluid	lb.	2.46 /	3.50
L-522 Organo-Silicone Fluid	lb.	2.68 /	3.50
Lubrex	lb.	.27 /	.32
Lubri-Flo	gal.	10.00 /	12.05
Lustermold	lb.	.41	
Mold Lubricant No. 426	lb.	.18	
Paste	lb.	.25	
Monopole Oil	lb.	.16	
Monten Wax	lb.	.57	
MR-22	gal.	9.95 /	14.95
Para Lube	lb.	0.46 /	.048
Paraflint RG and RGU Synthetic Wax	lb.	.15 /	.22
Plaskon 8406, 8407	lb.	.30 /	.37
8416, 8417	lb.	.35 /	.42
8429	lb.	.40 /	.47
Pluronics	lb.	.335 /	.44
Poly-Brite PE-20	lb.	.28 /	.42
600	lb.	.42 /	.58
Poly-Cone 125X	lb.	1.20 /	1.40
1000	lb.	.93 /	1.06
Polyglycol E series	lb.	.29 /	.42
RA-1, -2, -3	gal.	2.25 /	3.00
Rubber Glo	gal.	.94 /	.97
Silrex S-1	lb.	.65	
SM-33, -55, -61, -62	lb.	1.22 /	1.76
Soap, Hawkeye	lb.	1.25 /	1.45
Purity	lb.	.155 /	.165
Sodium stearate	lb.	.40	
Stoner's 700 series	gal.	1.20 /	1.25
800 series	gal.	1.26 /	1.70
900 series	gal.	1.55 /	2.55
A series	gal.	1.80 /	4.50
Ucon 50-HB Series	lb.	.25 /	.375
Ulco	lb.	.12 /	.23
Vanfre	gal.	1.95 /	3.00
XLE-420 Silicone Oil Emulsion	lb.	1.18 /	1.70

Odorants

Alamasks	lb.	$0.75 /	$6.50
Coumarin	lb.	2.95 /	3.55
Ethavan	lb.	6.75 /	7.35
Latex Perfume #7	lb.	4.00	
Neutroleum Gamma	lb.	3.60	
Rodo	lb.	4.00 /	5.50
Rubber Perfume #10	lb.	2.60	
Vanillin, Monsanto	lb.	3.00 /	3.15

Plasticizers and Softeners

Acintol DLR	lb.	.0625/	.085
Adipol 2EH, 10A, XX	lb.	.40 /	.44
BCA	lb.	.45 /	.475
ODY	lb.	.40 /	.44
Admex 710	lb.	.3325/	.3625
711	lb.	.3325/	.3825
744	lb.	.3925/	.3825
Aro Lene #1980	lb.	.10 /	.12
Baker AA Oil	lb.	.195 /	.24
Crystal O Oil	lb.	.21 /	.255
Processed oils	lb.	.215 /	.235
Bardol, 639	lb.	.0275/	.0375
B	lb.	.055 /	.065
Benzoflex 2-45	lb.	.26 /	.29
9-88	lb.	.27 /	.30
Bondogen	lb.	.555 /	.605
BRC-20	lb.	.022 /	.0245
22	lb.	.026 /	.0285
30	lb.	.0165/	.025
521	lb.	.023	
BRH 2	lb.	.0341/	.0351
BRS 700	lb.	.036	
BRT 7	lb.	.035 /	.036
BRV	lb.	.0625/	.065
Bunarex Liquid	lb.	.0875/	.0925
Resins	lb.	.085 /	.095
Bunatak AH	lb.	.085 /	.095
N	lb.	.31	
U	lb.	.175	
83	lb.	.0685	
90	lb.	.09	
210	lb.	.14	
Bunnatol G, S	lb.	.40 /	.505
Butac	lb.	.1735/	.1835
Butyl stearate, comml.	lb.	.255	
B-17	lb.	.22 /	.26
Binney & Smith	lb.	.23 /	.26
Harchem	lb.	.2525/	.3425
Kessoflex	lb.	.245 /	.275
Ohio-Apex	lb.	.26 /	.27
Butyl stearate—G.P.	lb.	.0125/	.02
R-100	lb.	.045 /	.0525
TT	lb.	.017 /	.02
Califlux 510, 550	lb.	.0275/	.0375
G.P.	lb.	.015 /	.0225
R-100	lb.	.0475/	.0575
T-T	lb.	.019 /	.0295
Capryl alcohol, comml.	lb.	.195 /	.30
Columbian Carbon	lb.	.195 /	.30
Harchem	lb.	.195 /	.30
Chlorowax 40	lb.	.1625/	.1825
70	lb.	.185 /	.245
-S	lb.	.21 /	.27
Circo light	gal.	.17	
Circosol-2XH	gal.	.185	
Contogums	lb.	.0875/	.111
Cumar Resins	lb.	.065 /	.17
DBM (dibutyl-m-cresol) Daraz	lb.	.32 /	.3475
DBP (dibutyl phthalate), comml.	lb.	.26 /	.40
Darex	lb.	.30 /	.33
Eastman	lb.	.285 /	.325
Harflex 140	lb.	.275 /	.315
Harwick Std. Chem. Co.	lb.	.325 /	.385
Hatco	lb.	.30 /	.33
Monsanto	lb.	.285 /	.325
Naugatuck	lb.	.30 /	.33
PX-104	lb.	.26 /	.30
Rubber Corp. of America	lb.	.285 /	.44
Sherwin-Williams	lb.	.30 /	.33
DBS (dibutylsebacate) comml.	lb.	.66 /	.69
Eastman	lb.	.655 /	.685
Harflex 40	lb.	.655 /	.685
Hatco	lb.	.66 /	.685
Monoplex	lb.	.66 /	.675
Naugatuck	lb.	.665 /	.69
PX-404	lb.	.665 /	.685
DCP (dicaprylphthalate), comml.	lb.	.295 /	.325
Harflex 180	lb.	.26 /	.30
Hatco	lb.	.295 /	.325
Monoplex	lb.	.30 /	.315
DDA (didecyladipate) Good-rite GP-236	lb.	.40 /	.59
Kessoflex	lb.	.40 /	.435
DDP (didecylphthalate) Good-rite GP-266	lb.	.295 /	.45
Hatco	lb.	.305 /	.435
Defoamer X-3	lb.	.355	
DIBA (diisobutyladipate) Darex	lb.	.4325/	.4625
Eastman	lb.	.40 /	.44
Ohio-Apex	lb.	.41 /	.45
DIDA (diisodecyladipate) Monsanto	lb.	.40 /	.44
RC	lb.	.40 /	.44
DIDP (diisodecylphthalate) Darex	lb.	.32 /	.35
Harflex 110	lb.	.265 /	.305
Monsanto	lb.	.26 /	.30
Ohio-Apex	lb.	.41 /	.45
PX-120	lb.	.26 /	.30
RC	lb.	.265 /	.305
Dielex B	lb.	$0.06	
Diethylene glycol, comml.	lb.	.1525/	$0.1825
Wyandotte	lb.	.15 /	.165
Di-2 ethylhexyl azelate	lb.	.455 /	.495
Dinopol IDO	lb.	.265 /	.305
DIOA (diisooctyladipate) Kessoflex	lb.	.40 /	.435
Naugatuck	lb.	.435 /	.465
PX-208	lb.	.40 /	.435
Rubber Corp. of America	lb.	.40 /	.44
DIOP (diisooctylphthalate), comml.	lb.	.305 /	.335
Darex	lb.	.32 /	.35
Eastman	lb.	.25 /	.29
Harflex 120	lb.	.26 /	.30
Hatco	lb.	.305 /	.335
Monsanto	lb.	.26 /	.30
Naugatuck	lb.	.305 /	.335
Ohio-Apex	lb.	.26 /	.30
PX-108	lb.	.26 /	.30
Rubber Corp. of America	lb.	.26 /	.30
Sherwin-Williams	lb.	.32 /	.34
DIOS (diisooctylsebacate), comml.	lb.	.61 /	.64
Rubber Corp. of America	lb.	.5925/	.6325
DIOZ (diisooctylazelate) Cabflex	lb.	.48 /	.51
Dipolymer Oil	gal.	.33 /	.48
Dispersing Oil No. 10	lb.	.06 /	.0625
DNODA (di-n-octyl-n-decyl adipate), Monsanto	lb.	.40 /	.44
DOA (dioctyladipate), comml.	lb.	.425 /	.455
Eastman	lb.	.40 /	.44
Good-rite GP-233	lb.	.40 /	.55
Harflex 250	lb.	.40 /	.435
Hatco	lb.	.435 /	.465
Monsanto	lb.	.40 /	.44
Naugatuck	lb.	.435 /	.465
PX-238	lb.	.40 /	.435
Rubber Corp. of America	lb.	.40 /	.44
DOP (dioctylphthalate), comml.	lb.	.305 /	.335
Darex	lb.	.32 /	.35
Eastman	lb.	.26 /	.30
Good-rite GP-261	lb.	.285 /	.44
Harflex 150	lb.	.26 /	.30
Hatco	lb.	.305 /	.335
Monsanto	lb.	.26 /	.30
Naugatuck	lb.	.305 /	.335
Ohio-Apex	lb.	.25 /	.29
Polycizer 162	lb.	.28 /	.435
PX-138	lb.	.25 /	.29
Rubber Corp. of America	lb.	.25 /	.30
Sherwin-Williams	lb.	.305 /	.335
DOS (dioctylsebacate) comml.	lb.	.61 /	.64
Eastman	lb.	.61 /	.64
Harflex 50	lb.	.5925/	.6225
Hatco	lb.	.61 /	.635
Monoplex	lb.	.61 /	.635
Naugatuck	lb.	.615 /	.64
PX-438	lb.	.5925/	.6225
Rubber Corp. of America	lb.	.5925/	.6325
Drapex 3.2	lb.	.40 /	.54
Dutch Boy NL-A10 (DBP)	lb.	.30 /	.33
-A20 (DOP), A30 (DIOP)	lb.	.305 /	.335
-A54	lb.	.295 /	.325
-C20 (DOS)	lb.	.61 /	.63
-F21	lb.	.395 /	.425
-F31	lb.	.44 /	.47
-F41	lb.	.48 /	.51
Dutrex 6	lb.	.025 /	.035
Dymerex Resin	lb.	.135 /	.1475
Elastex 36-R	lb.	.43 /	.4625
37-R	lb.	.70 /	.71
Emulphor EL-719	lb.	.52 /	.73
Endor	lb.	.67	
Ethox	lb.	.43 /	.455
Ethylene glycol, comml.	lb.	.135 /	.165
Wyandotte	lb.	.1325/	.1425
Flexol 3 GH	lb.	.44 /	.46
3 GO	lb.	.53 /	.55
4 GO	lb.	.325 /	.355
10-A	lb.	.425 /	.455
426	lb.	.27 /	.30
810, 810X, 10-10, 10-10X	lb.	.305 /	.335
TPF, A-26	lb.	.435 /	.465
Flexricin P-4	lb.	.3475/	.3625
P-6	lb.	.415 /	.43
Flexricin P-8	lb.	.3475/	.3625
PG-16	lb.	.335 /	.35
Fortex	lb.	.125 /	.145
Fura-Tone NC 1008	lb.	.28	
1012	lb.	.46	
G. B. Asphaltic Flux	gal.	.097 /	.177
Naphthenic Neutrals	gal.	.125 /	.215
Process oil, light	lb.	.0275/	.0375
Medium	lb.	.0375/	.0475
Galex W-100	lb.	.155 /	.18
W-100 D	lb.	.1525/	.1775
Gilsowax B	lb.	.0975/	.11
Harchemex	lb.	.24 /	.285
Harflex 300	lb.	.58 /	.615
325	lb.	.4325/	.46
375	lb.	.7425/	.83
500	lb.	.315 /	.41
HB-20	lb.	.15 /	.185
-40	lb.	.19 /	.23
Heavy Resin Oil	lb.	.0225/	.0375
HSC-13	lb.	.25 /	.32
-39	lb.	.22 /	.29
Hycar 1312	lb.	.60	
Hypalon Peptizer H-20	lb.	1.59	
Kapsol	lb.	.33 /	.355
Kenflex A, L	lb.	.26 /	.27
B	lb.	.23 /	.24
N	lb.	.18 /	.19

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by
CARY

*Registered Trade Mark

- Recommended usage: 2-4% of the weight of the rubber hydrocarbon, depending on the degree of protection desired.
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- Low Cost.
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VINYL RESINS • VINYL COPOLYMERS • VINYL COMPOUNDS • SPECIALTY WAXES
HIGH MELTING POINT SYNTHETIC WAXES

Kessoflex 103	lb.	$0.405	
105	lb.	.3325	
106	lb.	.38	
107	lb.	.525	
110	lb.	.24	
111	lb.	.28	
KP-23	lb.	.325 /	$0.335
-90	lb.	.40 /	.44
-140	lb.	.46 /	.485
-201	lb.	.46 /	.475
-260	lb.	.34 /	.38
Kronisol	lb.	.35 /	.385
Kronitex AA, I, K-3, MX	lb.	.325 /	.36
LX-685, -125, -135	lb.	.125 /	.135
Marvinol plasticizers	lb.	.28 /	.8825
Methox	lb.	.39 /	.425
Millrex	lb.	.15	
Monoplex S-38	lb.	.215 /	.24
S-71	lb	.45 /	.475
Morflex	lb.	.25 /	.65
Natac	lb.	.1685/	.1785
Neoprene Peptizer P-12	lb.	1.18	
W-9	lb.	2.28	
Nevillac	lb.	.31 /	.85
Neville R Resins	lb.	.145 /	.205
Nevinol	lb.	.24	
No. 1-D heavy oil	lb.	.065	
NP-10	lb.	.44 /	.48
ODA (octyldecyladipate)			
Good-rite GP-235	lb.	.40 /	.55
Kessoflex	lb.	.40 /	.435
RC	lb.	.40 /	.44
ODP (octyldecylphthalate)			
Good-rite GP-265	lb.	.29 /	.445
Hatco	lb.	.305 /	.335
Rubber Corp. of America	lb.	.265 /	.305
Ohopex Q-10	lb.	.275 /	.315
R-9	lb.	.3525/	.3775
Orthonitro benzophenol, comml.	lb.	.13 /	.15
Palmalene	lb.	.15	
Panaflex BN-1	lb.	.185 /	.225
Panarez Resins	lb.	.09 /	.14
Para Flux, regular	gal.	.10 /	.2125
No. 2016	gal.	.165 /	.24
2332	gal.	.11	
4205	lb.	.1075/	.2125
Para Lube	lb.	.46 /	.48
Resins	lb.	.04 /	.045
Paradene Resins	lb.	.07 /	.08
Paraplex 5-B	lb.	.29 /	.3475
Al-111	lb.	.32 /	.3275
G-25	lb.	.76 /	.77
-40	lb.	.4825/	.51
-50	lb.	.39 /	.4175
-53	lb.	.4325/	.46
-60	lb.	.325 /	.35
-62	lb.	.345 /	.37
RG-7	lb.	.33 /	.335
-8	lb.	.505 /	.5125
-10	lb.	.52 /	.5275
Pepton 22	lb.	.83 /	.86
65	lb.	1.23 /	1.26
65-B	lb.	.83 /	.86
Philrich 5	gal.	.125	
Picco Resins	lb.	.09 /	.17
480 Oilproof Series	lb.	.18 /	.23
Aromatic Plasticizers	lb.	.075 /	.095
Liquid Resin D-165 (Y)	lb.	.06 /	.075
(Z-3)	lb.	.07 /	.085
(Z-6)	lb.	.08 /	.095
S. O. S.	gal.	.29 /	.34
Piccocizers	lb.	.05 /	.07
Piccolastic Resins	lb.	.21 /	.27
Piccolyte Resins	lb.	.205 /	.245
Piccopale Resins	lb.	.12 /	.135
Piccovars	lb.	.165 /	.20
Piccovol	lb.	.025 /	.038
Pictar	gal.	.25 /	.40
Pigmentar	lb.	.046 /	.0634
Pigmentaroil	lb.	.046 /	.0634
Pitch, Burgundy, Sunny South	lb.	.103 /	.1085
Pitt-Consol 500	lb.	.28 /	.305
640	lb.	.42	
Plasticizers			
42	lb.	.34 /	.40
84	lb.	.25 /	.29
B	lb.	.35 /	.45
DP-520	lb.	.435 /	.455
MP	lb.	.035 /	.0755
MT-511	lb.	.6925/	.7425
ODN	lb.	.35 /	.475
SC	lb.	.38 /	.55
Plastoflex #3	lb.	.52 /	.57
#520	lb.	.36 /	.435
DBE	lb.	.50 /	.55
MGB	lb.	.29 /	.37
SP-2	lb.	.43 /	.48
VS	lb.	.3575/	.3975
Plastogen	lb.	.0875/	.09
Plastone	lb.	.25 /	.32
Polycin 470	lb.	.325 /	.34
Polycizers	lb.	.25 /	.415
162	lb.	.25 /	.405
Polymel-C	lb.	.1775/	.1875
C-130, DX	lb.	.1375/	.1475
D	lb.	.225 /	.235
D-TAC	lb.	.1975/	.215
Poly-Sperse AP-2	lb.	.23 /	.295
AP-300	lb.	.26 /	.325
LC-20	lb.	.26 /	.325
R-100	lb.	.17 /	.235
PT Pine Tars	lb.	.038 /	.0554
101 Pine Tar Oil	lb.	.038 /	.0554
Reogen	lb.	.1425/	.145
Resin C pitch	lb.	.0225/	.031
R6-3	lb.	.38 /	.40
Resinex 10, 25, 50, 110	lb.	.04 /	.045
70	lb.	.0325/	.0375
Resinex 85, 100	lb.	$0.035 /	$0.04
115	lb.	.0375/	.0425
L-2, L-3, L-4, L-5	lb.	.0225/	.03
Rosin Oil, Sunny South	gal.	.58 /	.76
RPA No. 2	lb.	.85	
3	lb.	.51	
Conc.	lb.	.85	
6	lb.	1.66	
RSN Flux	gal.	.10 /	.91
Rubber Oil B-5	lb.	.0225/	.0355
Rubberol	lb.	.18 /	.2725
Santicizer 1-H	lb.	.50 /	.52
8	lb.	.43 /	.47
9	lb.	.42 /	.44
140	lb.	.325 /	.36
141	lb.	.34 /	.375
160	lb.	.26 /	.30
409	lb.	.39 /	.42
603	lb.	.255 /	.295
B-16	lb.	.46 /	.49
E-15	lb.	.5225/	.5525
Santocizer	lb.	.4275/	.4575
Sebacic acid, purified, comml.	lb.	.59 /	.65
Binney & Smith	lb.	.64 /	.76
C. P.-Binney & Smith	lb.	.72 /	.84
Harchem	lb.	.655 /	.815
Sherolatum Petroleum	lb.	.05 /	.10
Softener #20	gal.	.10 /	.20
Special Rubber Resin 100	lb.	.1675/	.2175
Staflex AX	lb.	.43	
DBES	lb.	.61 /	.635
Syn-Tac	gal.	.33 /	.635
Synthol	lb.	.17 /	.2625
Tetraflex R-122	lb.	.245 /	.285
Thiokol TP-90B	lb.	.59	
-95	lb.	.65	
Triacetin	lb.	.37 /	.41
Tributyl phosphate	lb.	.50 /	.535
Tributyrin	lb.	.69	
Tricresyl phosphate, comml.	lb.	.33 /	.36
Monsanto	lb.	.325 /	.36
Naugatuck	lb.	.33 /	.36
PX-917	lb.	.33 /	.36
Triphenyl phosphate, comml.	lb.	.39 /	.40
Monsanto	lb.	.415 /	.435
Turgum S	lb.	.156 /	.166
SB	lb.	.105 /	.115
Turpol NC 1200	lb.	.61 /	.70
Tysonite	lb.	.3025/	.305
United	gal.	.69 /	1.20
X-1 Resinous Oil	lb.	.0225/	.0325

Reclaiming Oils

Bardol, 639	lb.	.0275/	.0375
B	lb.	.055 /	.065
BRH 2	lb.	.0213/	.0351
BRT 3	lb.	.02 /	.031
4	lb.	.02 /	.031
7	lb.	.035 /	.036
BRV	lb.	.0625/	.065
Burco-RA	lb.	.053 /	.0805
BWH-1	lb.	.16 /	.17
Dipolymer Oil	gal.	.33 /	.48
Dispersing Oil No. 10	lb.	.06 /	.0625
G. B. Oils	gal.	.115 /	.275
Heavy Resin Oil	lb.	.0225/	.0375
LX-572	gal.	.27 /	.32
-759	gal.	.1375	
-777, -809, -859	gal.	.23 /	.33
-869	gal.	.33 /	.43
-871	gal.	.34 /	.44
No. 3186	gal.	.28 /	.295
Picco 6535	gal.	.25 /	.30
C-33	gal.	.215 /	.385
-42	gal.	.23 /	.40
D-4	gal.	.27 /	.44
E-5	gal.	.25 /	.35
Q-Oil	gal.	.286 /	.36
Pitt-Consol 500	lb.	.28 /	.305
640	lb.	.42	
PT 101 Pine Tar Oil	lb.	.038 /	.0554
Reclaiming Oil #3186	gal.	.28 /	.385
-G	gal.	.25 /	.365
4039-M	gal.	.3275/	.3975
-Y	gal.	.30 /	.37
RR-10	lb.	.37	
S. R. O.	lb.	.015 /	.0225
X-1 Resinous Oil	lb.	.0225/	.0325

Reinforcers, Other Than Carbon Black

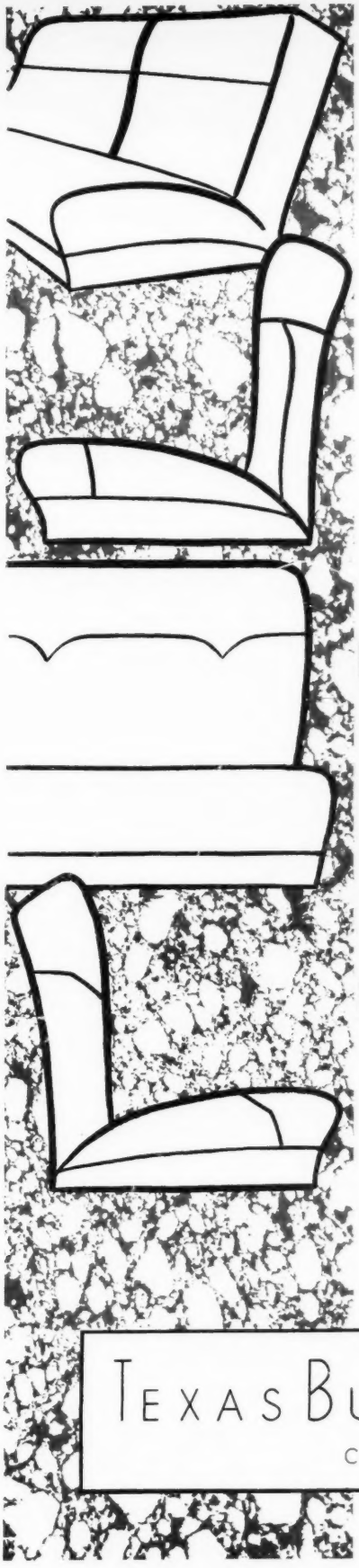
Angelo Shellacs	lb.	.485 /	.7325
Borden, Chem. Div.			
Arcco 978-42B	lb.	.18 /	.19
1073-18B	lb.	.135 /	.145
1294-36B	lb.	.115 /	.125
1301-12B	lb.	.15 /	.16
BRC-20	lb.	.0235/	.0245
22	lb.	.026 /	.0285
30	lb.	.0165/	025
521	lb.	.023	
Bunarex Resins	lb.	.085 /	.095
Cab-o-sil	lb.	.66 /	1.45
Calcene CO	ton	105.00 /	125.00
NC	ton	80.00 /	100.00
TM	ton	82.50 /	102.50
Car-Bel-Rez C	lb.	.126 /	.1451
Clays			
A. F. D. Filler	ton	29.50 /	36.00
Aiken	ton	14.00	
Albacar	ton	50.00 /	55.00
Buca	ton	45.00	
Burgess Iceberg	ton	50.00 /	80.00
Icecap K	ton	65.00 /	90.00
Burgess Pigment #20	ton	35.00 /	60.00
#30	ton	37.00 /	60.00
Catalpo	ton	35.00	
Champion	ton	$14.50	
Crown	ton	14.00 /	$33.00
Dixie	ton	14.50 /	15.00
Franklin	ton	13.50 /	35.25
GK Soft Clay	ton	11.00	
Harwick	ton	21.50 /	77.00
Hi-White R	ton	10.00 /	14.50
Hydratex R	ton	28.00	
Kaolloid	ton	10.50	
L. G. B.	ton	13.00 /	17.50
L. G. P.	ton	15.50 /	20.00
McNamee	ton	14.50 /	15.00
RX-43	ton	33.00	
Natka 1200	ton	13.00	
Par	ton	13.00 /	13.50
Paragon	ton	10.00 /	14.50
Pigment No. 33	ton	37.00	
Polyfil C	ton	25.00	
F	ton	45.00	
X	ton	30.00	
40	ton	40.00	
70	ton	53.00	
80	ton	65.00	
Recco	ton	14.00	
Sno-Brite	ton	12.50	
Stan-Clay	ton	28.00	
Stellar-R	ton	50.00	
Suprex	ton	10.00 /	14.50
Swanee	ton	12.50	
Whitetex	ton	50.00	
Windsor	ton	14.00 /	30.00
Witco No. 1	ton	14.00 /	30.00
No. 2	ton	13.50 /	30.00
Clearcarb	lb.	.1175/	.1255
Cumar Resins	lb.	.095 /	.19
Darex Resins	lb.	.42 /	.49
DC Silica	lb.	1.15 /	1.40
Diatomaceous silica	ton	32.00 /	48.00
Good-rite 2007	lb.	.36 /	.38
2057	lb.	.30 /	.31
Hi-Sil 233	lb.	.0825/	.0975
X303	lb.	.40 /	.45
Hycar 2001	lb.	.55	
2007	lb.	.39	
Indulins	lb.	.06 /	.08
Kralac A-EP	lb.	.43 /	.54
Laminar	ton	30.00	
Magnesium carbonate DCI	lb.	.11	
Magcarb L	lb.	.11 /	.14
Marbon Resins	lb.	.36 /	.43
Multifex MM	ton	117.50 /	137.50
Super	ton	167.50 /	187.50
Neville Resins			
465	lb.	.075 /	.08
LX-509	lb.	.33 /	.35
Nebony	lb.	.045 /	.05
Paradene	lb.	.07 /	.08
R	lb.	.145 /	.205
Para Resins 2457	lb.	.04 /	.045
Parapol S-Polymers	lb.	.44	
Picco Resins	lb.	.0850/	.19
Piccolyte Resins	lb.	.2225/	.2525
Piccoumaron Resins	lb.	.0875/	.19
Piccovars	lb.	.145 /	.20
Pliolite NR types	lb.	.98 /	1.33
S-3	lb.	.42 /	.49
-6	lb.	.36 /	.43
B	lb.	.36 /	.43
E	lb.	.36 /	.43
Plio-Tuf G85C	lb.	.52 /	.59
Purecal M	ton	56.75 /	71.75
SC, T	ton	110.00 /	125.00
U	ton	120.00 /	135.00
R-B-H 510	lb.	.15 /	.22
Resinex	lb.	.0375/	.0525
Rubber Resin LM-4	lb.	.28 /	.35
Silene EF	lb.	.06 /	.07
L	lb.	.0575/	.0675
Silvacons	ton	55.00 /	85.00
Transphalt	lb.	.0375/	.0575
Witcarb P	ton	117.50 /	153.50
R	ton	127.50 /	163.50
Regular	ton	60.00 /	96.00
Zeolex 23	lb.	.06 /	.07
Zinc oxide, commercial†	lb.	.145 /	.155

Retarders

Benzoic acid TBAO-2	lb.	.44	
Good-rite Vultrol	lb.	.62 /	.66
R-17 Resin	lb.	.1075/	.36
Retarder ASA	lb.	.57	
E-S-E-N	lb.	.39 /	.41
J	lb.	.68 /	.70
PD	lb.	.39 /	.41
W	lb.	.46 /	
Retardex	lb.	.47 /	.50
Thionex	lb.	1.14	
Wiltrol P	lb.	.37 /	.39

Solvents

Bondogen	lb.	.555 /	.605
Butyrolactone	lb.	.60 /	.65
Cosol #1	gal.	.37 /	.43
#2	gal.	.42 /	.48
Dichloro Pentanes	lb.	.04 /	.07
Dipentene DD, Sunny South	gal.	.42 /	.63
Ethylene dichloride, comml.	lb.	.09 /	.122
Hi-Flash 2-50-W	gal.	.41	
Pale yellow	gal.	.39	
LX-572	gal.	.27 /	.32
-748	gal.	.16 /	.23
Methyl-2-pyrrolidone	lb.	.75 /	.80
Neville Nos. 100, 104	gal.	.52 /	.60
106	gal.	.38 /	.46
Nevsolv H, 200	gal.	.19 /	.29
HF, T, 30	gal.	.24 /	.34



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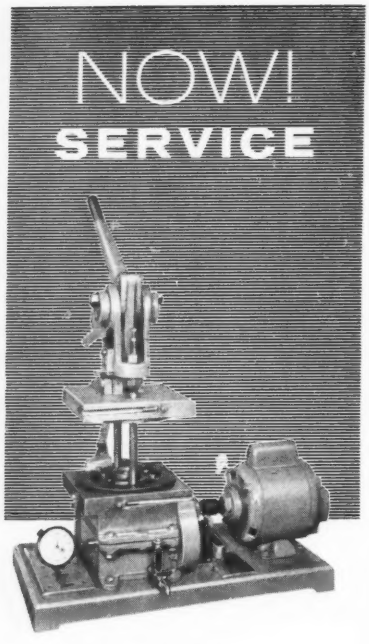

for your
MODEL NBS MOONEY VISCOMETER

Scott Testers now provides certified maintenance for Scott physical testing equipment—including the Model NBS Mooney Viscometer — at very reasonable cost to customers *throughout* the continental U. S. and Canada. Scott Tester service includes:

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- **Calibration**
- **Minor Repairs**
- **Work Report**
- **Certificate of Calibration** (often required on Govt. contracts)

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(2) INDIVIDUAL SERVICE PLAN
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SCOTT TESTERS
THE SURE TEST . . . SCOTT!

Penetrell	gal.	$0.42 /	$0.63
Picco Hi-Solv Solvents	gal.	.16 /	.48
Pine Oil DD, Sunny South	lb.	.15	
Skellysolve-B	gal.	.17	
-C	gal.	.162	
-H	gal.	.148	
-R, -V	gal.	.139	
Stauffer Carbon Disulfide	lb.	.0525/	.085
Tetrachloride	lb.	.0825/	.475

Tackifiers

Actinol DLR	lb.	.0625/	.085
Bardol, 639	lb.	.0275/	.0375
Borden, Arcco			
A25, A26, 716-30	lb.	.18 /	.19
555-40R	lb.	.185 /	.205
620-32B	lb.	.20 /	.21
716-35	lb.	.17 /	.18
1041-21	lb.	.165 /	.175
BRH 2	lb.	.0213/	.0351
Bunarex Resins	lb.	.065 /	.1225
Bunaweld 480	lb.	.24	
Chlorowax 70	lb.	.18 /	.24
Contogums	lb.	.0875/	.11
Cumar Resins	lb.	.095 /	.19
Galex W-100	lb.	.155 /	.17
W-100D	lb.	.1525/	.1625
Indopol H-35	gal.	.65 /	.84
H-50	gal.	.70 /	.89
-100	gal.	.85 /	1.08
-300	gal.	1.00 /	1.24
-1500	gal.	1.48	
L-10	gal.	.40 /	.59
-50	gal.	.45 /	.64
-100	gal.	.55 /	.74
Kenflex resins	lb.	.18 /	.27
Koresin	lb.	.90 /	1.10
Natac	lb.	.1685/	.1785
Nevindene	lb.	.15 /	.18
Picco Resins	lb.	.0875/	.19
Piccolastic Resins	lb.	.21 /	.27
Piccolyte Resins	lb.	.2225/	.2525
Piccopale Resins	lb.	.089 /	.13
Piccoumaron Resins	lb.	.0875/	.19
R-B-H 510	lb.	.15 /	.22
Roelflex 1118A	lb.	.39	
Synthetic 100	lb.	.41	
Synthol	lb.	.17 /	.2625
United	gal.	.69 /	1.20
Vistanex, LM grades	lb.	.45	

Vulcanizing Agents

Dibenzo G-M-F	lb.	2.60	
G-M-F #113, #117	lb.	.90	
Di-Cup	lb.	1.10	
Dodecenylsuccinicanhydride	lb.	.75 /	.76
HMDA-Carbamate	lb.	4.50 /	4.90
Ko-Blend I, S	lb.	.39	
Litharge (*See Accelerator-Activators, Inorganic*)			
Magnesium oxide	lb.	.2525/	.38
DCI	lb.	.215 /	.235
601	lb.	.2525	
Maglite D, K, Y	lb.	.2525/	.28
M	lb.	.27 /	.30
Marmag	lb.	.23 /	.265
Michigan No. 1782	lb.	.2525/	.30
PSD 85	lb.	.37 /	.50
Red Lead (*See Accelerator-Activators, Inorganic*)			
Seamag	lb.	.20 /	.22
Sulfasan R	lb.	1.55	
Sulfur flour, comml.	100 lbs.	2.55 /	3.30
1018	lb.	.12 /	.1575
Aero	100 lbs.	2.40 /	7.75
Crystex	lb.	.195 /	.23
Insoluble 60	lb.	.125 /	.13
Rubbermakers	100 lbs.	2.65 /	4.55
Stauffer	lb.	.0265/	.054
Telloy	lb.	4.00	
VA-7	lb.	.50	
Vandex	lb.	7.00	
Vultac No. 2	lb.	.47 /	.74
3	lb.	.51 /	.78
White lead silicate (*See Accelerator-Activators, Inorganic*)			

Synthetic Rubbers

(Continued from page 130)

Synpol 8200	$0.191[b] /	$0.197[b]
8201, 8208	.175[b] /	.181[b]
8202	.1725[b]/	.1785[b]

Cold SBR Oil-Black Masterbatch

Ameripol 1805	.155[c] /	.161[c]
1808	.148[c] /	.154[c]
1809	.1545[c]/	.1605[c]
1810	.140[c] /	.146[c]
4759	.16 /	.166
4760	.1576[c]/	.1636[c]
4761	.171[c] /	.177[c]
Baytown 1801		.176[b]
Carbomix 3751, 3758	.1545[c]/	.1605[c]
3733	.164[c] /	.170[c]
3757	.148[c] /	.154[c]
3760-NS	.1496[c]/	.1556[c]
Gentro-Jet 9250		.158
9251		.164
Gentro-Jet 9252		$0.167
9275		.150
OB-102		.1825[a]
-104		.1475[a]
-110		.141[a]
Philprene 1606	$0.182[b] /	.188[b]
1803	.174[b] /	.18[b]
1805	.155[b] /	.161[b]
1808	.148[b] /	.154[b]
6604	.208[b] /	.214[b]
6608	.146[b] /	.152[b]
6662	.1845[b]/	.1905[b]
S-1800		.1475[a]
-1802		.141[a]
-1803		.165[a]
-1806		.151[a]
-1807		.154[a]
-1808		.142[a]
Synpol 8253	.1584[b]/	.1644[b]
8254	.1545[b]/	.1605[b]
8255	.148[b] /	.154[b]
8267	.164[b] /	.17[b]

Cold SBR Rosin Masterbatch

Copo 3900	.231[c] /	.237[c]

Cold SBR Latex

CL-101		.28[a]
Copo 2101	.30[c] /	.4025[c]
2102, 2105, 2110	.32[c] /	.3725[c]
2108	.30[c] /	.3675[c]
2109	.2775[c]/	.3450[c]
3852	.30[c]	
FR-S 2105	.32[c] /	.366[c]
Naugatex 2105, 2107	.32[a] /	.38[a]
2108	.30[a] /	.38[a]
2113	.29[a] /	.36[a]
Pliolite Latex 2101		.30[c]
2105, 2107		.32[c]
2108		.30[c]
Polysar Latex 721		.32[c]
S-2101		.26[a]
-2105		.28[a]
-2107		.32[a]
-2108		.29[a]

Misc. SBR

FR-S-110 (latex)	.3000[c]	
-150 (latex)	.3000[c]	
-174 (latex)	.2950[c]	
-176 (latex)	.2775[c]	
-182	.241[c] /	.247[c]
-184	.1885[c]/	.1945[c]

Urethane Types

Adiprene L, LD-167,-213	1.15 /	1.65

■

Pelletized News

(Continued from page 18)

on the recommendation of their respective boards, recently formed a merger by an exchange of shares into a new holding company, London Sumatra Plantations. The companies involved are: United Serdang (Sumatra) Rubber Plantations, Allied Sumatra Plantations, Lankat Rubber Co., Mendaris (Sumatra) Rubber & Produce Estates, Soengei Rampah Rubber & Coconut Plantations, Tandjong Rubber Co., Toerangie (Sumatra) Rubber & Produce Estates. The authorized capital of London Sumatra is £1,100,000, and the group will control 71,000 acres of rubber yielding more than 17,750,000 pounds annually, in addition to 8,000 acres of oil palm.

BELGIAN CONGO exported 40,161 tons of rubber in 1959, against 35,081 tons in 1958. More than a third of this rubber went to the United States last year. In view of the present severe disorders prevailing in Belgian Congo since it became independent, it is logical to expect a drop in exports from this territory during the current year.

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Take advantage of outstanding career opportunities in elastomers technology. Your work with this progressive organization will include laboratory applications research and development as well as direct customer contact in automotive, mechanical goods, or latex uses. This is your chance to grow with a rapidly expanding department of a leading petrochemical company. You will find excellent opportunities for personal advancement, professional recognition, publication of papers, and participation in technical society activities.

If you are a graduate from an accredited college with 2-8 years experience in the dry rubber or latex industries, please reply to

ENJAY LABORATORIES
Box 175
Linden, New Jersey

A PROGRESSIVE RUBBER FABRICATOR IN CONNECTICUT has an opening for a mold line foreman experienced in all phases of rubber molding. Salary commensurate with experience. Also an excellent opportunity for further advancement. Address Box No. 2507, care of RUBBER WORLD.

SENIOR RESEARCH CHEMISTS

Challenging openings on San Francisco peninsula. Degree in Chemistry or Chemical Engineering. Five to ten years' experience in rubber compounding and production. Record of development in precision molded rubber products. Salary open. Liberal benefits. Advantages of small division with security and financial stability of large corporation. Replies confidential. Send résumé to:

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SITUATIONS OPEN (CONTINUED)

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Silicone Rubber

The continuing expansion of our silicone rubber programs has made available the opportunity to ally personal growth to an expanding business in the chemical industry.

These application development/technical service positions offer unique opportunities to become expert in a new field with high potentiality for advancement to a field sales position after 2-3 years.

Current openings are in wire and cables and fabricated rubber application areas.

BS in Chemistry or chemical engineering with 2 to 5 years experience in technical service, product development or manufacturing, preferably in the rubber industry.

Send resume in confidence to:
Mr. R. I. Clark, Manager, Employee Relations

SILICONE PRODUCTS DEPT.

GENERAL ELECTRIC

Waterford, New York

PRODUCTION MANAGER

With mechanical, chemical, development experience and education for expanding seasoned smaller factory to international. Opportunity and good salary if qualified. Address Box No. 2514, care of RUBBER WORLD.

HELP WANTED

Well established New England firm has opening for Plant Manager with Chemical background. Must know all phases of compounding and molding. All information held in strictest confidence.

ADDRESS BOX NO. 2510 c/o RUBBER WORLD

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CONTINENTAL TAPES • CAYCE, S. C.

INVESTIGATE SOUTH CAROLINA

Opportunities for Adhesive and Polymer Chemists, Chemical Engineers and Consultants.

Send résumé

CONTINENTAL TAPES, CAYCE, S. C.

EXTRUSION CHEMIST WANTED

We have an opening in our organization for a rubber chemist to serve as assistant to chief chemist. Minimum of three years' experience in compounding of extruded products desired. Also, would prefer man to have had experience in automotive extruded compounding. Salary up to $7,200.00, depending on qualifications. Opportunity for growth with expanding company. Send résumé. THE SPERRY RUBBER & PLASTICS CO., BROOKVILLE, INDIANA.

ASST. COMPOUNDER; MILL, MIXING, TROUBLE-SHOOTING experience in molded rubber polymers. Some lab experience. Wages open, commensurate with experience. Midwest. Address Box No. 2509, care of RUBBER WORLD.

WANTED: RUBBER CHEMIST EXPERIENCED TO TAKE charge of development and quality control of small manufacturer of medicinal rubber closures in the Delaware Valley area. Address Box No. 2519, care of RUBBER WORLD.

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PLANT MANAGER. MUST RELOCATE. 22 YEARS' SOLID background in all phases of administration and manufacturing. Diversified and wide product lines. Successful proven record as administrator and in labor relations. Wish to associate with progressive and growing company. Address Box No. 2502, care of RUBBER WORLD.

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CHEMIST—10 YEARS' EXPERIENCE ALL PHASES, RUBBER & vinyl compounding. Adhesives—vinyl film plastisols—custom compounding. Address Box No. 2504, care of RUBBER WORLD.

EXECUTIVE RUBBER AND PLASTIC CHEMIST

now in research and development. 24 years' laboratory and plant experience in cables, tires and mechanical goods. Challenging position desired. Salary over $15,000. Address Box No. 2508, care of RUBBER WORLD.

PRODUCTION CONTROL MANAGER

With many years' diversified experience in Molded Rubber and Vinyl products — Desires contact with reliable growing Company. Available now. Address Box No. 2516, care of RUBBER WORLD.

SITUATIONS WANTED (CONTINUED)

CHIEF CHEMIST-TECHNOLOGIST WITH TEN YEARS' EXperience in all elastomers, specialized in high-temperature, oil-resistant rubbers, seeks responsible position. Address Box No. 2513, care of RUBBER WORLD.

RUBBER CHEMIST

Broad experience "Viton," Fluorel, all major polymers. Developed "Viton" flexible —100° F. Consider consultant work or permanent situation. Prefer West Coast. Address Box No. 2515, care of RUBBER WORLD.

RUBBER TECHNOLOGIST: OVER FIFTEEN YEARS' DIVERsified background in mechanical rubber goods, seeks responsible position in development or production. Experience includes compounding, manufacturing, supervision, management, development, cost estimation, raw materials, etc. Address Box No. 2517, care of RUBBER WORLD.

TECHNICAL SERVICE AND/OR SALES POSITION DESIRED. Experience includes compounding, development, production, as well as sales and service to the rubber and allied industries. Address Box No. 2518, care of RUBBER WORLD.

MACHINERY & SUPPLIES FOR SALE

FOR SALE: BAKER-PERKINS ≠ 15-UUMM DISPERSION BLADE double-arm mixer, 100-gallon, jacketed, 100-HP explosion-proof motor, motorized tilt, cored blades, compression ram cover. Also 200-gallon B-P mixers. PERRY EQUIPMENT CORP., 1424 N. 6th St., Phila. 22, Pa.

TWO CALENDERS FOR SALE

One—10" x 26" Three-Roll with 15 H.P. 220—44-V—U.S. Veridrive Motor.

One—Three-Roll—6" x 18" rolls mounted on stand—with or without motor and drive. Address Box No. 2505, care of RUBBER WORLD.

— FOR SALE —

4—Blaw Knox 6' x 40' horizontal vulcanizers with quick-opening doors, 250≠ working pressure, ASME.
2—Royle ≠½ extruders, complete.
1—Peerless guillotine cutter, 30" blade, with motor.
1—Allen 4" extruder with 25-HP motor.
Address Box No. 2506, care of RUBBER WORLD.

QUALITY EQUIPMENT at REASONABLE PRICES

MILLS: F-B Unused 2-Roll Mills 14" x 30" late type with Uni-Drives. Also 16" x 36"; 18" x 42"; 22" x 60".
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VULCANIZERS: 6' x 16' ASME coded.
PRESSES: Colton Model 5½ PRE-FORM: Stokes Model 280; 4" Dia. Pre-Form; HPM 300-Ton 4-Post Molding Press, HPM Size 1200 H 60 A injection Molding Press; 60-oz. 100 HP Motor; 3 French Oil Mill Presses, 10" Ram; Dunning & Boschert Presses, 12" Ram; Stewart-Bolling 22" Ram, 36" x 36"; 6 Southwark Presses, 14" Ram; 36" x 36".
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SPECIAL: F-B Belt Press 52" x 31"; 2 opngs.
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FIRST MACHINERY CORP.
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STerling 8-4672; Cable: Effemcy

FOR SALE

15 x 40" Kelly-Farrel calender, 3-roll vertical, for rubber, little used, complete. HOUSTON RUBBER MACHINE COMPANY, 3301 Jensen Drive, Houston 26, Texas.

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THE STANDARD FOR SAFETY

• Proved in years of efficient service, FLEXO JOINTS offer the flexibility of hose — the strength of pipe — the ideal steam connection for presses, tire molds, etc.

Four styles, for standard pipe sizes ¼" to 3".

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FARREL 16″ x 40″ TWO-ROLL MILL. OTHER SIZES UP TO 60″. Hydraulic Presses: 300-ton, 42″ x 42″ platens, 5 opening. 300-ton upstroke 40″ x 30″. 300-ton upstroke 22″ x 35″. 240-ton upstroke with ten 24″ x 56″ platens. 200-ton Farrel 30″ x 30″. Farrel 150-ton, 36″ x 36″. Bolling 150-ton, 24″ x 24″. Also other sizes. MPM 3½″ wire covering Extruder. Adamson 6″ Rubber Extruder. New and used Laboratory 6″ x 13″, 6″ x 16″, and 8″ x 16″ Mills and Calenders. Baker-Perkins and Day heavy-duty jacketed Mixers up to 200 gallons. Hydraulic pumps and Accumulators. Peerless 2-HP Rubber Bale Cutter. Rotary Cutters, Banbury Mixers, Crushers, Churns, Tubers, Vulcanizers, Gas Boilers, etc. SEND FOR SPECIAL BULLETIN. WE BUY YOUR SURPLUS MACHINERY. STEIN EQUIPMENT COMPANY, 107- 8TH STREET, BROOKLYN 15, NEW YORK. STERLING 8-1944.

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Banbury Mixer, #00 with steamheated chamber and complete with hopper and motor drive. HYDRAULIC PRESSES FROM LARGE NEW ENGLAND RUBBER PLANT, 24″ x 24″ UP TO 60″ x 60″. MANY PRESSES 6, 8, 10 OPENINGS. ALL EQUIPPED WITH LIFT TABLES. UP TO 500-TON CAPACITY. BUY ON LOCATION! Farrel 50″ Top Cap Mill with 100-HP motor drive. Farrel 60″ Mill with reducer and motor drive. 16″ x 30″ Rubber Cracker Mill. Complete with 100-HP motor drive. 600-Ton Adamson Slab Side 8-Opening Hydraulic Press, 42″ x 42″ platen, steamheated, 26″ chrome-plated ram. Allen 6″ Rubber Tuber with strainer head. Royle #2, 3½″ Rubber Extruder. A full line of equipment for the Rubber Industry: Banbury Mixers, Tubers, Rubber Mills, Molding Presses, Die Cutting Presses, Accumulators, Vulcanizers, etc., etc. Write for brochure on our new 6″ x 13″ Rubber Lab Mill. WE WILL FINANCE. JOHNSON MACHINERY COMPANY, 90 Elizabeth Avenue, Elizabeth, New Jersey. ELizabeth 5-2300.

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1—10″ x 24″ Thropp 3-roll calender; 1—24″ x 24″—6 opening Erie hydraulic press, 18″ ram; 1—16″ x 40″ 2 roll mill, M. D.; 1—Royle #½ tuber, 1⅛″ worm.
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36″ Spadone Cutter, #3139, Alfa Type F.F. complete w/S.S. Dangle Roll Unit, Take-Up Frame, Roll Drive Trimmer and Cutter, Rubber Roll Unit for Stacker, Stacking and Trontork Electronic Control.
36″ Spadone Cutter, #3219, Alfa Type E.S. w/Take-Up Frame, Rubber Feed Roll, Speed Reducers and Motors.
Motor Driven Wind Machines, 36″ — 4
Jacques Bench Shears, 36″ to 72″ — 5
All in good condition.

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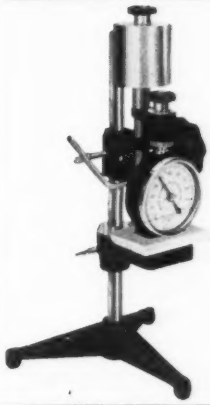

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Various models for testing the entire range of hardness from elastomeric to rigid. Available in quadrant or round dial case. May be used free hand or on table top OPERATING STAND WITH DEAD WEIGHT (left).

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ANYTHING AND EVERYTHING
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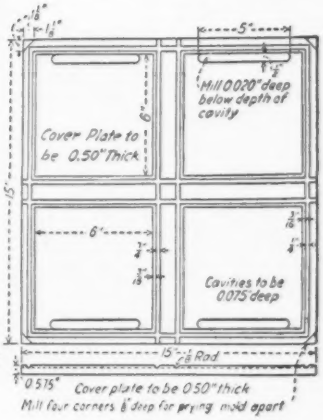
HOGGSON

"DUMBBELL" Test Strip Die D412(51T)

TOOLS, MOLDS, DIES
For Rubber Testing and Production

For making tensile test samples, we make many types of slab molds. One is detailed at the right. These are plain or chrome finished. We usually stock molds for making adhesion, abrasion, flexing, compression and rebound test samples, but supply special molds promptly. We also furnish hand-forged tensile dies for cutting regular or tear test samples.

SLAB→ MOLD D15-55


5"
Mill 0.020" deep below depth of cavity
Cover Plate to be 0.50" Thick
6"
6"
Cavities to be 0.075 deep
15"
⅛" Rad
0.515" Cover plate to be 0.50" thick
Mill four corners ⅛" deep for prying mold apart

HOGGSON & PETTIS MFG. CO., 141S Brewery St., New Haven 7, Conn.
Pac. Coast: H. M. Royal, Inc., Downey, Calif.

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CUSTOM COMPOUNDS
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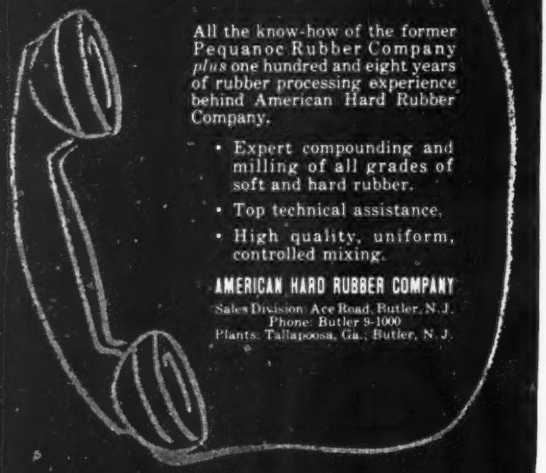
AMERICAN HARD RUBBER



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- Expert compounding and milling of all grades of soft and hard rubber.
- Top technical assistance.
- High quality, uniform, controlled mixing.

AMERICAN HARD RUBBER COMPANY
Sales Division: Ace Road, Butler, N.J.
Phone: Butler 9-1000
Plants: Tallapoosa, Ga.; Butler, N.J.

MACHINERY AND SUPPLIES WANTED

WANTED A 4 LM BLACK ROCK ROLL GRINDER IN GOOD condition, and a large roll grinding lathe with a 30-inch swing or larger, 10 feet between centers. Will pay well for good machinery. Address Box No. 2512, care of RUBBER WORLD.

WANTED: Compact 24" or 30" rubber mixing mill approx. 1:35 to 1 roll speeds. TEMPRON PRODUCTS CORP., 26 Granite St., Milford, Mass.

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WANTED TO BUY

Small rubber manufacturing business that can be moved to California without substantial loss of customers.

ADDRESS BOX NO. 2491, c/o RUBBER WORLD

MIXING

To Your Specification

K. B. C. INDUSTRIES, INC. NEW HAVEN, CONN.
881 State Street Tel: State 7-5662
Otto J. Lang, General Manager

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A modern, efficient, medium-size company in the rubber shoe industry in Germany (located near Frankfurt/Main) seeks to diversify its production. It is interested in establishing a working arrangement with an American rubber fabricating company for the purpose of producing that company's technical rubber products in Germany and distributing them throughout the European Common Market.

For further information, write to:

BOX NO. A 1764, c/o RUBBER WORLD

index to advertisers

A

Albert, P. E., & Son 145
Allied Chemical Corp., National Aniline Division 113
American Hard Rubber Co. 146

B

Beacon Chemical Industries, Inc. .. 109
Bolling, Stewart, & Co., Inc. 128

C

Cabot, Godfrey L., Inc. .. Insert 115-122
Carter Bell Mfg. Co., The 40
Cary Chemicals, Inc. 139
Chemdye Rubber Corp. 48
Claremont Flock Corp. 125
CLASSIFIED ADVERTISEMENTS 143, 144, 145, 146
Cleveland Liner & Mfg. Co., The Inside Back Cover
Columbia-Southern Chemical Corp. Insert 24, 25
Columbian Carbon Co. 56, 57
Commercial Solvents Corp. 27
CONSULTANTS & ENGINEERS ... 145
Continental Carbon Co. 60, 61
Continental Tapes 144

D

Dalton Supply Co. 145
Dow Corning Corp. 137
DPR Incorporated, A Subsidiary of H. V. Hardman Co. 50
Durez Plastics Division, Hooker Chemical Corp. 58

E

Eagle-Picher Co., The 44
Eastman Chemical Products, Inc. .. 41
English Mica Co., The 129
Enjay Chemical Co., A Division of Humble Oil & Refining Co. 111
Enjay Laboratories 143

F

Flexo Supply Co., Inc. 144

G

General Electric Co. 143
General Tire & Rubber Co., The (Chemical Division) 28, 29
Getty Machine & Mold, Inc. 50
Goodrich, B. F., Chemical Co. 5
Goodrich-Gulf Chemicals, Inc. Insert 95-98
Goodyear Tire & Rubber Co., Inc., The (Chemical Division) Insert 13-14; 15

H

Hall, C. P., Co., The 52
Harwick Standard Chemical Co. ... 67
Hercules Powder Co. 49
Hoggson & Pettis Mfg. Co., The ... 145
Holmes, Stanley H., Co. 44
Hooker Chemical Corp., Durez Plastics Division 58
Houdry Process Corp. 62
Huber, J. M., Corp. 68

J

Johnson Corp., The 48
Johnson Steel & Wire Co., Inc. .. 54, 55

K

K. B. C. Industries, Inc. 144

L

Litzler, C. A., Co., Inc. 26

M

Marbon Chemical Division of Borg-Warner Corp. 17
Merck & Co., Inc. 32, 33
Midwest Rubber Reclaiming Co. .. 107
Mobil Oil Co. 42, 43
Monsanto Chemical Co. 59
Morton Chemical Co. 51
Muehlstein, H., & Co., Inc. Back Cover

N

National Aniline Division, Allied Chemical Corp. 113
National Rosin Oil Products, Inc. .. 129
National-Standard Co. 123, 125, 127, 129
Naugatuck Chemical Division of U. S. Rubber Co. ..... 45; Insert 46
Neville Chemical Co. 135
New Jersey Zinc Co., The 11

P

Phillips Chemical Co. 8

R

Rare Metal Products Co. 129
Richardson, Sid, Carbon Co. 148
Richardson Scale Co. 16
Roebling's, John A., Sons Division, Colorado Fuel & Iron Corp., The Insert 35
Ross, Charles, & Son Co., Inc. 22
Royle, John, & Sons 21

S

Sargent's, C. G., Sons Corp. 47
Scott Testers, Inc. 142
Shaw, Francis, & Co., Ltd. 66
Shell Chemical Co., Synthetic Rubber Division 53
Shore Instrument & Manufacturing Co., Inc., The 145
Siempelkamp, G., & Co. 31
Silicones Division, Union Carbide Corp. 18
Sinclair-Collins Valve Co., The 19
Singer-Fidelity, Inc. 63
Snell, Foster D., Inc. 145
South Texas Tire Test Fleet, Inc. ... 125
Spadone Machine Co., Inc. 20
Stamford Rubber Supply Co., The .. 34

T

Texas-Butadiene & Chemical Corp... 141
Texas-U.S. Chemical Co. .. Insert 64, 65

U

Union Carbide Corp., Silicones Division 18
United Carbon Co., Inc. Second Cover
United Rubber Machinery Exchange 144
U. S. Rubber Reclaiming Co., Inc. .. 30
Universal Oil Products Co. 37

V

Vanderbilt, R. T., Co., Inc. 70

W

Wellington Sears Co. 36
Wiegand, W. B. 145
Witco Chemical Co., Inc. 60, 61
Wood, R. D., Co. 38, 39

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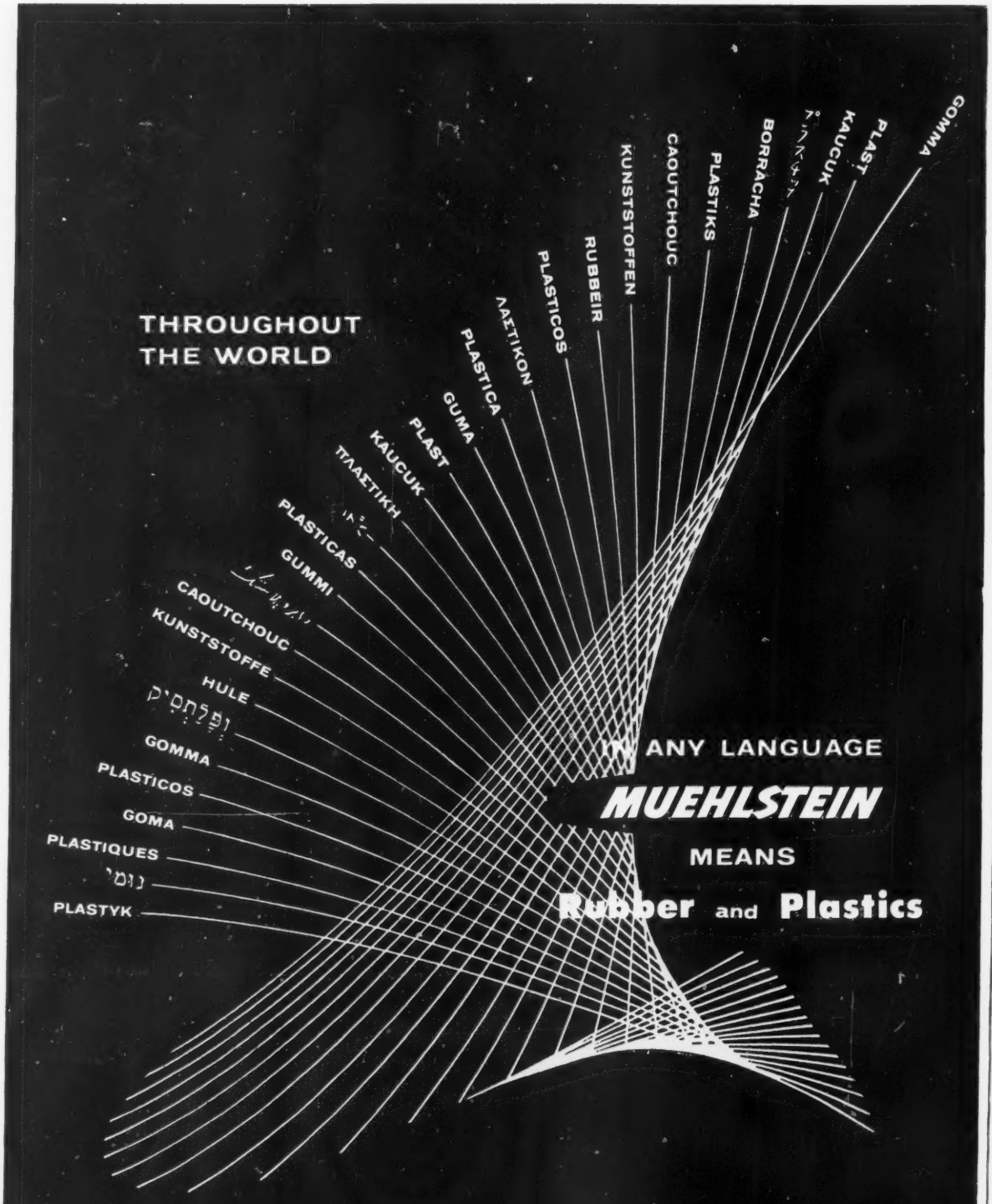

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